CONSEIL PERMANENT INTERNATIONAL POUR
L'EXPLORATION DE LA MER
CHARLOTTENLUND SLOT. — DANEMARK

RAPPORTS
ET
PROCÈS-VERBAUX DES RÉUNIONS

VOLUME CV

2ÈME PARTIE
RAPPORT ADMINISTRATIF

(1936—1937)

EN COMMISSION CHEZ
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Octobre 1937

NOTICE

The annual Procès-Verbaux des Réunions will be issued in three parts under the same volume-number:

1° Report of Proceedings at the annual Council Meeting,

2° Administrative Reports for the past year, and

3° Appendices to reports and proceedings, i. e., minor reports to administrative reports and papers read at Committee meetings.

Each part will be published separately and issued as soon as possible.

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Copenhague — Imprimerie Bianco Luno A/S.

REPORT

of

ADMINISTRATION 1936—1937.

(June 12th, 1937).

I. General.

ıposition of the International Council for the Exploration of the Sea.

e composition of the International Council has ıot been subject to changes in number of ring countries during 1936—37, but the request the Latvian Government for full membership inally agreed by the Governments of all adhering tries, and the full membership of Latvia, there- came into force as from July 22nd 1936. As to gates the Portuguese Government has announced etirement of Admiral TITO DE MORAIS as Delegate Portugal. No new Delegate has as yet been inted.

last year's meeting replies had not been received the Spanish and Portuguese Governments as hesion for a further period of 5 years (1936—41); then a renewal of co-operation has been promised ɔth countries and the Council is thus composed urteen countries as before.

Composition of the Bureau.

change as to the composition of the Bureau aken place during the past year, and the Bureau consists of:— Mr. H. G. MAURICE, President; ssor JOHAN HJORT, M. THÉODORE TISSIER, C. HEINRICI and Professor MARTIN KNUDSEN, Presidents; — Professor OTTO PETTERSSON is dent D'Honneur with the right to attend meetings e Bureau.

Committees.

list of Committees will be found in the Procès- aux of the last Council Meeting. These Com- es remain in being and no change of member- has been announced up to date.

Audit of Accounts.

In the Administrative Report of last year a preliminary statement of accounts was recorded; this has been audited by a qualified Accountant and an alteration was made to the Statement of Pension Fund Account, affecting also the Balance Sheet. The corrected Statements are reprinted from the Accountant's Statement with the preliminary Statements for the last financial year, 1936/37 (p. 5). The Accounts have been inspected by the Finance Committee and will be submitted to the Council for final approval.

A preliminary statement of accounts for the year 1936—37 is given overleaf; due to exceptionally late receipt of manuscripts and delay with the agreement in connexion with new premises, it has not been possible to finish the accounts for audit prior to this year's meeting; no vital alteration, however, is expected when finished.

The following items give rise to special remarks:

Item no. 13 has been overdrawn by Kr. 650.— due to the necessity of employing extra assistance during Mrs. BRUUN's three months' illness.

Items no. 14 a and b: the low amount is caused by payment in advance of rent for the "Eltham" (April—October) from the previous year's account. The rent this year covers the period November—March. In future rent will be payable on October 1st for one year and will include heating.

Item 14 c is considerably above ordinary expenditure because all stationery had to be renewed and a certain quantity of files and archive boxes had to be bought. The total of item 14, however, is kept well within the grant.

Item 15, Travelling expenses, reach some 60 % of the estimate only, as the special meeting of sardine experts did not take place.

Income and Expenditure Account for the year ending March 31st 1937.*)

EXPENDITURE

		Estimates	Expenditure	
	I. Incidentals			
1	President		6,000.00	
2	Chairman of Editorial Committee	*17,000.00*	2,000.00	
3	Hydrogr. Consultant		3,000.00	
4	Editor of Statistics		2,000.00	
5	Editors of Journal		4,000.00	
				17,000.00
	II. Headquarter Staff			
6	Adm. Secretary	*12,000.00*	12,000.00	
7	Hydrographer	*3,000.00*	3,000.00	
				15,000.00
	Clerical Staff			
8	1st Asst. Secretary		6,000.00	
9	2nd — —		5,000.00	
10	Statistical —	*26,000.00*	4,800.00	
11	Secretarial Assistant		2,400.00	
12	Hydrograph. Secretary		3,000.00	
13	Clerical Assistance		5,450.00	
				26,650.00
	III. Office Expenses			
14a	Rent		2,193.33	
b	Light and Heating		393.86	
c	Stationary, Books, etc.		3,745.38	
d	Teleph., Telegr., Postage	*15,000.00*	1,361.12	
e	Furniture and Fittings		287.65	
f	Insurance		530.81	
g	Upkeep, Cleaning, Rep.		2,080.69	
h	Miscellaneous		2,071.01	
				12,663.85
15	**IV. Travelling Expenses**	*12,000.00*		6,895.22
16	**V. Chairmen of Committees**	*31,000.00*	28,750.00	
	due to Vice-Chairman of Atlantic Slope Ctee[1])		2,250.00	31,000.00
17	**VI. Printing and Distribution**	*44,000.00*		33,619.01
	Ordinary Expenditure	*160,000.00*		142,828.08
	VII. Extraordinary Expenditure			
18	Fiches Faunistitiques	*8,000.00*	2,351.97	
19	Removal and New Furniture	*13,000.00*	13,141.30	
20	Credit for work by Dr. J. W. Sandstrøm	*5,750.00*[2])	2,023.88	
21	Expenses in connexion with Dr. von Buddenbrock's work	*3,000.00*	3,000.00	
22	Honoraria for authors of Vols. XCV and XCVII.	*1,500.00*	1,500,00	22,017.15
	VIII. Pension Fund			
23	Transferred according to Standing Resolution	*3,500.00*	3,500.00	
24	Refund of Pensions	*7,425.00*	7,425.00	10,925.00
	Total Expenditure	*202,175.00*		175,770.23

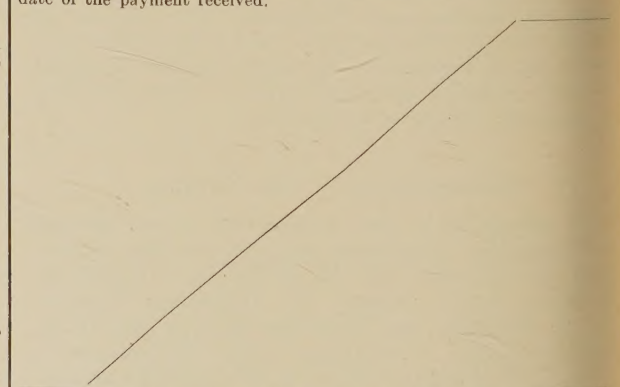
[1]) Paid into special a/c with bankers until remittance to Spain is again possible. [2]) In addition to item V under Income.

*) Subject to audit.

INCOME

		Estimates	Income	
	I. Annual Contributions[1])			
	France $^{6}/_{7}$ 37 1936—37	*20,000.00*	20,000.00	
	Germany $^{28}/_{12}$ 36 —	*20,000.00*	20,000.00	
	Great Britain $^{9}/_{6}$ 37 —	*20,000.00*	20,000.00	
	Spain —	*20,000.00*		
	Denmark $^{9}/_{3}$ 37 —	*10,000.00*	10,000.00	
	Holland $^{13}/_{7}$ 37 —	*10,000.00*	10,000.00	
	Norway $^{3}/_{3}$ 37 —	*10,000.00*	10,000.00	
	Poland $^{16}/_{12}$ 36 —	*10,000.00*	10,000.00	
	Sweden $^{11}/_{7}$ 36 —	*10,000.00*	10,000.00	
	Belgium $^{16}/_{1}$ 37 —	*5,000.00*	5,000.00	
	Finland $^{28}/_{6}$ 37 —	*5,000.00*	5,000.00	
	Irish Free State $^{8}/_{3}$ 37 —	*5,000.00*	5,000.00	
	Latvia $^{6}/_{2}$ 37 —	*5,000.00*	5,000.00	
	Portugal $^{13}/_{4}$ 37 —	*5,000.00*	5,000.00	
		155,000.00		135,000.00
II.	Outstanding as per $^{21}/_{7}$ 1937			20,000.00
III.	Interests on Bank Deposits	*1,000.00*	817.61	
	Interests on Investments	*6,000.00*	6,000.00	
		7,000.00		6,817.61
IV.	Sale of Publications	*2,000.00*	2,511.44	2,511.44
	Ordinary Income			164,329.05
V.	Contribution from the Association Internationale d'Océanographie Physique towards special expenditure in connexion with Prof. Sandstrøm's work	£ 250		5,593.75
				169,922.80

[1]) The dates after the name of the country indicate the date of the payment received.



Excess of Expenditure over Income chargeable to Capital Reserve	5,847.43
	175,770.23

Statement of Pension Fund Accounts 1935—36.

EXPENDITURE		INCOME	
Drechsel's pension	6,500.00	Balance as per April 1st, 1935	39,018.60
Schøning's pension	3,000.00	Transferred from revenue	3,500.00
ce as per March 31st, 1936	44,489.54	Refund of pensions paid	9,500.00
		Interests	1,970.94
	Kr. 53,989.54		Kr. 53,989.54

Statement of Pension Fund Accounts 1936—37.

EXPENDITURE		INCOME	
Drechsel's pension	6.500.00	Balance as per April 1st, 1936	44,489.54
Schøning's pension	925.00	Transferred from revenue	3,500.00
ce as per March 31st, 1937	50,212.39	Refund of pensions paid	7,425.00
		Interests	2,222.85
	Kr. 57.637.39		Kr. 57,637.39

n 18, Chairmen of Committees, is entered with ıll amount, but due to difficulties with trans- g payments to Spain, Kr. 2250 due to the Vice- man of the Atlantic Slope Committee are as yet d. This amount has been paid into a special nt with the bank.

e cost of Printing and Distribution is some) Kr. below estimates due to the indefinite onement of a Northern North Sea Report and e necessity of carrying Mr. Matthews' Tables to this year's budget.

e total of ordinary expenditure thus is some) Kr. less than estimates and 21,500 Kr. less ordinary income.

ɪraordinary Expenditure has been fairly heavy, ıainly, to removal and purchase of new furniture; aune Ichthyologique it was expected to finish ear, but 2 out of 4 sets only have been issued. ast set of 26 plates is in preparation and the f contents will finish this publication.

ım of Kr. 5,750.00 was granted for Dr. Sand- r's work; about Kr. 2,000 only has been drawn his has been paid out of the contribution from ssociation Internationale d'Océanographie Phy- £250 (= Kr. 5,593.75). The total of extra- ary expenditure amounts to Kr. 32,942.15, ordinary income to Kr. 5,593.75. The excess of expenditure over income thus amounts to 847.43 to be drawn from capital.

luding the pension fund accounts the capital Council almost equals that of last year: Kr. 9.40 as against Kr. 293,063.98 a year ago.

Meetings.

tings of the Bureau were held in May, 1936, March, 1937, in Copenhagen and London, tively; all members of the Bureau and the ıistrative Secretary were present at both meetings. The Honorary President, Professor O. Pettersson, attended the London meeting.

The President attended the celebration of Professor Gilson's Jubilee on behalf of the International Council on Sunday June the 14th, 1936, at which occasion he made a brief speech on their behalf:

"Au nom du Conseil International pour l'Exploration de la Mer, que j'ai l'honneur de représenter ici, je salue, dans la personne de mon cher Collègue et Ami, le Professeur Gilson, un des savants du Conseil les plus estimés.

C'est avec un plaisir tout particulier que j'ai entendu les éloges prononcés à son égard par ses confrères de cette Université si renommée, éloges auxquels le Conseil que je préside s'associe avec enthousiasme. Car il se peut que nous autres, membres du Conseil International, connaissions mieux que vous, ses compatriotes, la valeur de celui auquel nous rendons hommage aujourd'hui. Vous l'applaudissez comme un Savant Belge dont son université a le droit d'être fière; nous l'acclamons à titre de Savant Européen, qui, depuis une trentaine d'années, c'est-à-dire depuis l'entrée en 1903 de la Belgique au Conseil International, a joué un rôle inestimable dans nos travaux entrepris en commun qui ont pour but de coopérer à maintenir et à accroître la prospérité des pêcheurs dans tous les pays participants.

Nous avons aussi pu reconnaître en lui non seulement des talents remarquables mais encore une ténacité qui ne le laissait jamais se décourager en face des plus grands obstacles, ainsi qu'une modestie et une courtoisie qui le rendaient cher à tous ses collègues.

En ma qualité de Président du Conseil International, auquel il a apporté la renommée de sa haute autorité scientifique, j'ai l'honneur de représenter les quatorze nations qui participent aux travaux du Conseil. Ainsi, c'est en leur nom à toutes que je félicite notre cher Collègue de son jubilé, je félicite son Université de

Balance Sheet, 31st March, 1936.

LIABILITIES			ASSETS		
Capital Reserve:			Cash at Bankers	16,127.56	
Balance per April 1st, 1935	237,839.38		— - Savingsbank	680.43	
Excess of Income over Expenditure	10,735.06		— in hand	624.34	
					17,432.33
Balance as per March 31st, 1936		248,574.44	Danish Treasury Bonds (nom. value Kr. 120,000; market value on March 31st, 1936, Kr. 123,600) at cost		118,543.43
Pension Fund		44,489.54	Pension Fund:		
Total Funds		293,063.98	Cash at bankers	584.81	
Sundry Creditors as per March 31st, 1936		8,051.85	Danish Treasury Bonds (nom. value Kr. 43,700; market value on March 31st, 1936, Kr. 44,378) at cost	43,904.73	
					44,489.54
			Sundry Debtors as per March 31st, 1936		120,650.53[1]
		Kr. 301,115.83			Kr. 301,115.83

Balance Sheet, 31st March, 1937.

LIABILITIES			ASSETS		
Capital Reserve:			Cash at Handelsbanken	50,700.62	
Balance per April 1st, 1936	248,574.44		— - Ordrup Charl. Bank	1,961.89	
plus Excess of ordinary Income over ordinary Expenditure	21,500.97		— in hand	3,194.26	
plus Extraordinary Income	5,593.75				55,856.77
	275,669.16		Danish Treasury Bonds (nom. value Kr. 120,000; market value on March, 31st, 1937, Kr. 119,400) at cost		118,543.43
less Extraordinary Expenditure chargeable to Capital Reserve	32.942,15		Pension Fund:		
		242,727.01	Cash at bankers	5,059.61	
Pension Fund		50,212.39	Danish Treasury Bonds (nom. value Kr. 44,900; market value on March 31st, 1937, Kr. 44,760) at cost	45,152.78	
Total Funds		292,939.40			50,212.39
Sundry Creditors as per March 31st, 1937		12,057.33	Sundry Debtors as per March 31st, 1937		80,384.14[1]
		Kr. 304,996.73			Kr. 304,996.73

[1]) Furthermore Rbl. 14,430.54 (Russian Contr. 1914/15) deposited in a Leningrad Bank from which it has not yet been possible to withdraw it.

posséder en lui un Savant si distingué et sa Patrie d'avoir donné naissance à un fils doué de tant de qualités si dignes d'estime.

Enfin, à vous, mon cher Collègue et Ami, je souhaite en leur nom la longue continuation d'une vie si précieuse pour tous ces nombreux collègues qui vous admirent et vous aiment."

Dr. J. P. JACOBSEN represented the Council in Edinburgh at the meeting of the Association Internationale d'Océanographie Physique.

The meeting of sardine experts planned last year (Rapp. et Proc.-Verb., Vol. No. 100, I, p. 25 (and 47)) has been postponed until the present trouble in Spain has passed.

On October the 26th a meeting of the Sub-Committee (Messrs. DEFANT, KNUDSEN and ZEILON) appointed for purpose of keeping in touch with the work of Professor J. W. SANDSTRÖM, took place in Copenhagen. Professor ZEILON being prevented from attending, Professor SANDSTRÖM met Professor DEFANT, Professor KNUDSEN and Dr. JACOBSEN to discuss a plan of work. Professor SANDSTRÖM explained the programme laid down by him and demonstrated coloured plates of charts *en miniature*, intended to give a quick survey of changes in meteorological conditions, month by month and year by year.

A. Publications.

eport regarding publications issued and cost of same during the financial year 1936—37.

Series	Volume	Pages	Subject	Estimated	Cost
app. &	C (I—III)	200	Procès-Verbal, Rapport Administratif et Appendices.	*6,000*	4,611.58
s-Verbaux	CI (I—III)	168	Reports of Special Meetings	*3,000*	3,420.72
—	CII	118	Baltic and Transition Area Report	*2,500*	2,770.25
—	CIII	34	Critical Review of the Methods used for determining nutrient salts and related constituents in salt water	*1,500*	693.12
—	CIV	38	Rapport Atlantique	*2,500*	911.15
			Northern North Sea Report	*3,000*	0
ulletins		122	Bulletin Hydrographique 1935 ..... Kr. 4,767.00	*5,000*	
			less 6 3/5 pages observations published at the cost of the Woods Hole Oceanografic Institute ..... - 264.00		
					4,503.00
—		72	Bulletin Statistique 1934	*2,000*	1,609.56
			Mr. Matthew's Tables	*2,000*	0
al du Conseil					
	Vol. XI, 1—3	406		*8.000*	7,307.61
			Miscellaneous	*1.500*	977.00
			Total...		26,803.99
			Translations	*2,000*	1,208.50
			Distribution	*3,000*	3,284.27
			Registration of Hydrographic data	*2,000*	2,322.25
			Grand Total Kr....	*44,000*	33,619.01

II. Work of the Office in Copenhagen.

e ordinary routine work has been carried out e customary lines and the usual statements as blications, hydrographical, and statistical work below.

Removal. On October 24th to 31st, the offices moved from "Eltham" to the Charlottenlund and from November 1st the premises were so order that ordinary routine could be followed. furniture and fittings were installed, library and es preliminarily arranged etc. The extension or-space has improved working conditions con-bly and the fittings purchased and installed llow extensions for a series of years without g shortage of space of any kind.

Library. A great part of the Council's Library tored in boxes at "Eltham", and difficult to ce if needed; the whole of the Library has now arranged, unbound, in dust-proof cardboard provided with indications as to origin: Name ntry, a serial number and consecutive numbers ding to demand. The new premises do not in any single room large enough for the entire y, and it has, therefore, been arranged in two ooms and on the landing, while the statistical e hydrographical-meteorological parts of the y have been placed in the corresponding tmental rooms. Series already bound, mostly l series, have been collected in the Bureau-room. housand Danish Kroner was the sum granted for binding of books before removal, this sum d inadequate and the box-system was therefore luced.

3) Catalogue. The catalogue arranged alphabetically, commenced last year, from the Bibliography of the Journal, has been finished and will be kept up to date with each additional list issued. Mrs. Bruun, who is now engaged as Librarian, has finished an index of the Library boxes, arranged according to series only, and has commenced a general catalogue of the Library, arranged in accordance with the bibliography. The Librarian is otherwise responsible for arranging the daily additions to the Library.

4) Archives and stocks. The archives of the bureau have been properly arranged and the stocks of publications, previously stored at the printers' premises, have been arranged in one of the out-buildings. Having inspected the store-rooms of the printers it was found too dangerous to continue such storage; in case of fire the entire stock would have been destroyed without hope of saving but a fraction of the stock.

5) Card-index-department. The work on the card-index has been continued, and a detailed report will be prepared for the Consultative Committee at their next sitting.

6) A Studio has been installed for Leica-photography with special dark-room for developing, copying and enlarging of films, and a Leica-film archive has been founded. Also the necessary fittings for copying drawings and tables etc. on light-sensitive paper have been fixed in order to save expenses of having this kind of work done outside and to save an unnecessary amount of work with duplicating lists, tables and similar circulars.

Publications.

The above report regarding publications agrees with the Estimates of last year's meeting with the exceptions: that a Northern North Sea report has been postponed indefinitely due to lack of contributions, and that the publication of Mr. MATTHEWS' Tables has had to be carried over to next year although most of the manuscript has been received, but other work has prevented the final preparation for publication.

This item does not give rise to special remarks, but it should be reported that trade-conditions in Denmark have made it necessary to consent to an increase of some 10 % on the general cost of printing; a further rise in cost of paper is expected but it is hoped to prevent too drastic increases on this account.

As to the Faune Ichthyologique the last set of 24 (or 26) sheets is in preparation and the list of contents to follow will then terminate the series.

B. Hydrographical Department.

The usual work of reporting meetings has been carried out as in the previous years by the Hydrographer and his Secretary, while the routine work has been carried out by mutual assistance of the administrative and the hydrographical staff; it concerns the issue of the Bulletin Hydrographique, the preparation of separate lists of observations and of redrawing and duplicating of thermograms.

Thermograms have been received as last year from Norwegian liners and have all been redrawn and copied for quick reproduction as and when required. — The hydrographical material arranged in sections or by routes have been retyped on special lists for quick reproduction on light-sensitive paper, and are now arranged in such a way that a copy of any section can be dispatched without delay from the Central Office as and when required.

The Bulletin Hydrographique for 1935 has been published and contains some 34,000 observations as against 48,000 last year and 45,000 in 1933; this decrease is mainly due to the number of data of the "Atlantis" being less than usual as also to lack of "Dana"-observations and French and Spanish data.

The hydrographical card-index has been completed as far as the Atlantic is concerned; this part now contains all data published in the series Bulletin Hydrographique since 1902 up to date, and in addition the major part of observations recorded in other publications (viz. Annales Hydrographiques, Annalen der Hydrographie, Archiv der Deutschen Seewarte, "Discovery", "Dana", and "Meteor"-reports and others) have been added to the index cards; this work will be continued as far as it is possible to procure publications containing such records. The present index covers the southern as well as northern Atlantic. The Baltic material is well in hand and will be continued.

Samples of sea water have been received for control analyses from the British Admiralty (9 samples) and from the Department of Lands and Fisheries, Dublin (6 samples).

C. Statistical Department.

The Bulletin Statistique for the year 1934 was published during 1936 and the work on the Bulletin for the year 1935 is now so far advanced that it can be completed shortly after the receipt of the Icelandic statistics which are expected to reach the Statistical Department before the end of June.

Reports of Area Committees.

NORTH-EASTERN AREA COMMITTEE

1936.

By

Oscar Sund (Vice-Chairman).

ty years ago the North-Eastern Area mostly erested Norway as the only nation which l on fisheries of any importance in these waters ɔm the year 1906 British trawlers were the first e part in the utilisation of the fish resources of ɔrthern parts of the Area, and then in later (after the War) German and Russian and even ı and Spanish trawlers have followed. A close ration in the manifold task of investigating resources and their natural foundations is ɔre imperative but has hitherto developed in ewhat lopsided fashion. Russia, like Norway riparian country and consequently specially ted in developing the knowledge of the waters ıeir commercial possibilities and limitations. btedly, Russia has carried out a great amount ul work, but not being a member of the Inter- al Council her contributions can scarcely be as co-operation as the results are available ith difficulty if published at all. As for the utions of the other nations, Norway alone has ined a consistent, though far from satisfactory, n the various necessary lines of research, while ny has contributed a very regular work in a ed field (market measurements) and on two ns has made a thorough oceanographic summer n the Barents Sea. Other nations have made nal contributions, Scotland by several summer in the border area between the North Sea e Norwegian Sea with the research vessel rer", England a certain amount of market measurements and observations at sea by scientific observers travelling on board trawlers, a very useful way of collecting evidence as to the consequences of the intensified trawling operations upon the stocks of food fishes. It is very much to be desired that this sort of work be continued to enable it to become a regular feature on the working programme of all fishery research institutions in those countries which send trawlers to the waters in question. In view of the regular sampling of fish landed in Germany and Norway and the fairly regular investigation of the coastal waters and banks by Norway this sort of work seems the most necessary and also the most promising and easiest to arrange.

The work done in 1936 does not differ materially from that of 1935 neither in kind nor scope as the following details will show.

WORK AT SEA

Norway.

The Fisheries Directorate kept the "Johan Hjort" in commission most of the year and also hired the vessel of the Geophysical Institute (the "Armauer Hansen") for two periods of about 3 weeks each while 6 cruises in the west coast fjords were performed by the Directorate's smaller vessel, the "Virgo". The "Johan Hjort" was used for investigations on the west coast early in January in connection with the herring fishery, in February to the beginning of April,

along the coast from Bergen to Lofoten, most of the time in the Lofoten area and in April on the Vesterålen and Troms coast and in the shelf area and outside this. In May the vessel again investigated the coast southwards to Bergen and the fjords as far as Stavanger where echo-sounding for sprats was a special object. In June a cruise was undertaken to the Finmark waters with a number of sections to some considerable distance from the shore. In July again the fjords south of Bergen were searched for sprats. In the autumn, from the middle of September, a cruise of ten weeks was undertaken along the coast as far as East Finmark having as its principal object the study of the occurrence of young fish and plaice and the investigation of prawn-trawling grounds. It may be noted, in passing, that a good prawn fishery has developed in two places, the Porsanger fjord and the Ofoten fjord, as a consequence of the above-mentioned investigations where the use of the echo-sounder proved to be of the highest service in locating bottom of suitable character.

The "Armauer Hansen" was used from February 11th to March 27th on the west coast in connexion with a study of the spawning areas of the herring and between April 21st and May 9th for an oceanographic cruise in the Northern North Sea. The Tromsø Museum carried out, by means of a subsidy from fishery funds, a ten-week cruise in West Finmark fjords and coastal waters in March to the end of June. The work of the Museum of monthly oceanographic and plankton investigations at 12 places in the vicinity of Tromsø was carried out in part only because the vessel (the "Sparre Schneider") was occupied elsewhere (a. o. West Finmark) for extensive periods.

Scotland.

Traverses between Lerwick and Bergen and Bergen-Flugga were accomplished in April by the Scottish research vessel "Explorer". The main objects were (1) to analyse the haddock populations and (2) to survey the prevailing hydrographic and planctonic conditions. The stations were so spaced as to give a representative picture of these conditions between the Shetlands and Norway so that the strength of the Atlantic spring influx through the northern gateway to the North Sea might be determined with accuracy. The observation stations on the outward journey from Lerwick were fixed just north of the 60th parallel, while those on the return journey from Bergen were arranged along the 61st degree of latitude. Three stations were worked within the Norwegian Deep at rectangles J19c (60°01′ N.—04°13′ E.), H20d (60°44′ N.—03°45′ E.) and G21d (61°01′ N.—02°30′ E.). Observations were also carried out at three other stations on the eastern edge of the plateau, immediately west of the deep water, at rectangles H19c (60°01′ N.—03°00′ E.), G20d (60°44′ N.—02°30′ E.) and G21c (61°01′ N.—02°00′ E.). Trawling was not undertaken within the Norwegian Deep.

PLANKTON

Norway.

Collection of zooplankton with the surface net of 1 m. diam. (silk 0) and with the vertical net of 72 cm. diam. (silk 8) was a regular feature on all the cruises.

Scotland.

Plankton was collected at all stations on the aforementioned cruises. A detailed report on the results will be found in the report of the Plankton Committee. The Hardy Plankton Indicator (original type) was streamed over a small portion of the cross section between Lerwick and Bergen and continuously over the northern crossing between Bergen and Flugga. The results will be published in due course.

HYDROGRAPHY

See report of the Hydrographic Committee.

FISHING TECHNIQUE

Norway.

As a result of the observations on the behaviour of the spawning cod by means of an echo-sounder it was concluded that some gear built on the principle of the "sinking net" would prove the most efficient mode of capture. This net, unfortunately, requires much more space than permitted by the dense congestion of boats on the grounds where the cod occur in concentrations necessary for this gear; experiments were therefore carried out late in April at Lofoten in order to alter the net's mode of operation so as to obviate the difficulty alluded to, and the experiments were so far successful as a combination of the sinking-net and the purse-seine principles provided the means of making very swift hauls with very small inconvenience to other boats in the vicinity. The experiments will be continued in 1937 if suitable concentrations of cod will occur.

On one occasion the value of the echo-sounder for detecting herrings was demonstrated. The herring were found in very deep water in the Ofoten fjord during the day time; and with the fading out of daylight their rising was observed and as they were approaching the surface the purse seiners present in the neighbourhood could be warned and shown to the spots where the herring were in the best position to be caught.

A series of experiments were carried out during the Lofot season with the view of obtaining evidence as to what size of mesh of cod gill-nets would be most effective in giving a heavy catch. These experiments will be reported on in a near future (by Mr. Rollefsen).

BIOLOGY OF FISH

nany.

investigations on landed fish carried on by the itsstelle für Fischereiforschung der Staatlichen gischen Anstalt auf Helgoland und des Instituts eefischerei in Wesermünde" were continued in without change. The market measurements rised the following numbers of fish of different from the several grounds:

Species	Barents Sea	Bear Isld.	Norw. coast	Total No.
.....	2,778	2,200	4,366	9,344
ock.....	3,351	928	3,296	7,575
.....	..	364	808	1,172
sh (Seb.)....	183	..	858	1,041
kinds.....	279	724	386	1,389
Total...	6,591	4,216	9,714	20,521

majority of the fish measured were also weighed dually.

vay.

. (Fisheries Directorate). Fish measurers and h collectors were stationed at six places during pawning cod ("skrei") fishery, viz.: Kabelvåg, nd, Værøy, Røst in Lofoten, at Gryllefjord on land of Senja (Troms) and at Bjørnsund on the coast. The number of fish measured were 69,000, blind" method being used. About 3,500 fish were ed for otoliths and their individual weight , whole and gutted as well as weight of liver onads. During the spring cod fishery in Finmark urers were stationed at Mehamn, Berlevåg and . They measured 35,000 cod and collected 1,000 otoliths.

appears that the dominating year-classes of " were 1926, 1927 and 1928. These made up 703 of the stock together. A curious phenomenon bserved: a steady increase during the last few of the mean size of the spawning cod with l to age, e. g., the length of the 8-year-olds in was 73 cm., in 1936 83 cm., the other year- s showing similar increase in size. This marked se in size has been accompanied by a decrease mean age at maturity: in 1932—33 the average f first-spawners was about 10·5 years, now it llen to about 9 years only (Rollefsen).

estigations into the different types of cod have continued along the coast with special regard phological characters and to the ecology of -group. This group has been investigated as to ers of vertebrae and it appears that the young, ng in the shore region, have a number corre- ing to that of the coastal cod while those caught ep water, 2—300 m. — and a great quantity ncountered in these depths — have the same er as the "Skrei" and "Loddetorsk", i. e., the ts Sea migrating stock or the "Arcto-Norwegian Cod". The difference amounts to about one unit, resp. 52·3—52·7 and 53·3—53·7 vert.

Herring. The investigations into the biology of herring have been continued as last year. 49 samples (8,351 ind.) of winter-herring were investigated with regard to age and vertebral numbers and 34 samples of fat- and small-herrings in the same way. Between February 11th and March 27th the "Armauer Hansen" was employed in a search for herring spawn on the west coast and in April this work was continued in North Norway by the "Johan Hjort".

Sprat. Investigations into the stock were carried on by means of about 100 samples from commercial (purse seine) catches; 90 of these from the west coast, the others from the south and east coast.

Haddock. During the Finmark spring fishery about 5,000 haddock were measured and otolith material collected.

Plaice. The commercial catches have been sampled along the whole of the coast from the Trondheim fjord northwards and quantitative fishing for fry has been carried out in many places. In one district arrangements have been made for monthly collections.

The vertebral number of a great number of fish has been counted. It appears for instance that the Trondheim fjord has its own stock with a lower vertebral number than that of the coast outside the fjord. The number increases both northward and southward from the Trondheim fjord.

Experiments on the effects of artificial propagation of plaice have been continued by the Directorate of Fisheries at the Biological Station in Trondheim. In 1935 about 2 million hybrids from plaice and flounder were liberated in the almost landlocked branch of the Trondheim fjord: the Borgen fjord, and when fishing for fry in the same autumn 2 % hybrids were found among the 0-group. In 1936 the experiment was reiterated with a number of 13 million of the same crossing and in the autumn the 0-group of flat fish was found to contain 30 % hybrids. (The normal occurrence of this crossing is very feeble in this locality, among 5,000 flatfish (plaice) only one hybrid could be found.)

The relative viability of the bastard- and plaice fry was investigated by liberating in a rock basin of 400 m.³ 190,000 bastard fry and 170,000 plaice fry, both hatched from the same mother on May 1st. The rock-pool was emptied on July 27th and 200 small flat fish were found to remain. Vertebral counts shewed that all were bastards (Vert. No. 38·61). The corresponding figure for the hybrids recaptured in the Borgen fjord was 38·98.

Halibut. In the autumn quite a new fishery began in the North Country: gill netting of halibut in very deep water, on clay bottom. Samples of the catch of this novel industry were taken for the first time in November and continued to the end of the year. The new fishery seems to depend on spawning concentrations in the deepest parts of each fjord. A considerable number of halibut were marked.

Eel. The Directorate organized experimental fishing for emigrating eel, especially in the districts around Bergen. The experiment will be resumed next season although the 1936 results were scarcely encouraging.

Publications (issued in 1936).

J. Lundbeck: Die Deutsche Fischerei im Barentsmeer, bei der Bäreninsel und an der Norwegischen Küste in der Fangzeit 1935/36. Deutsche Fischerei Rundschau, Heft 20/21, 1936.

Johan Hjort, J. Lie and Johan T. Ruud: Pelagic Whaling in the Antarctic, V. The Season 1934—35. Hvalrådets Skr. No. 12.

Einar Lea and A. E. Went: Plastic Copies of Microscopical Reliefs, especially of Fish Scales. Hvalrådets Skr. No. 13.

Oscar Sund: Fiskeforsøk i Lofoten. Forsøk med skj[illegible] snurpenot. Årsberetn. vedk. Norges Fiskerier 19[illegible] No. 2, p. 27. (Contains also diagrams showing occu[illegible] rence of spawning cod detected by echo-sounding, i[illegible] relation to simultaneously ascertained temperatu[illegible] gradients).

— Skreimerking i 1935. *Ibidem*, p. 106. (Results of tag[illegible] ging experiment in Lofoten).

— Torskebestanden i 1936. *Ibidem*, p. 114. (Results o[illegible] cod measurements during the seasonal fisheries).

— and Odd Bostrøm: Høla i Lofoten. Bunnrelieff[illegible] undersøkt med ekkolodd. *Ibidem*, p. 127. (Botto[illegible] form ascertained by means of echo sounding in an important fishing area. Contour chart in 1 : 70,000 and normalized echo profiles).

Jens Eggvin: Oceanografiske Forhold i Nord-Norge under Lofot- og Finmarkfisket 1936. *Ibidem*, p. 131. (Oceanography of the Northern regions during winter and spring in Lofoten and early summer in Finmark. Charts.)

NORTH-WESTERN AREA COMMITTEE

1936.

By

Å. Vedel Tåning.

ing 1936 nearly all countries represented on e Committee have made contributions to the Of the two countries which have recently the Committee, Holland has made a cruise to aroes and Iceland, and various other countries, ipating in the work for many years, have also l out cruises in the area in order to compensate ss of data ordinarily procured by the Danish ch vessel. The contribution thus given to the of the Committee is very valuable, as a break ising several years is thereby prevented and aterial collected in order to follow the various of important food fishes, the hydrography of ea etc. is continued. The English research vessel ge Bligh" made a circumnavigation of Iceland cruise in the Denmark Strait during the months: -July. The Scottish research vessel "Explorer" l round the Faroes in June. The Icelandic vessel "Thor" made two cruises during the n February and in June/August. As previously oned, the Dutch vessel "Nautilus" made a to the Faroes and a circumnavigation of Ice- n the months: May—June. The Committee is nely grateful to all who have shared in the le contribution to the work within the area. problems in the extensive North-Western Area numerous and so varied that it is to be hoped uch cruises in future will be succeeded by ones, thereby contributing to various special s in the area and to the collection of the con- s biological and hydrographical observations which future science may extract important , which are as yet but dimly anticipated.

o Hydrography and special Plankton investi- s carried out in the area particulars are found reports of the respective Committees.

Denmark.

No research vessel was available during 1936 for the ordinary cruise in the North-Western Area; the new research vessel was not launched until January 9th, 1937. As mentioned above, several other countries, however, have continued the work which for several years has been upheld chiefly by Denmark, and moreover various other means were used to procure material of value to the continuous investigations of the Committee within the area.

Faroes.

During the month of June 304 cod of medium size were marked with the Danish cod mark and liberated by the Scottish research vessel "Explorer" at various localities round the islands; 74 specimens or 24 % were recaptured during the following six months (72 by British, 2 by Faroese fishermen). The marking experiments on cod at the Faroes during the years 1932—1936 have shown, that about 95 % of the cod recaptured are taken by British, the rest by Faroese fishing vessels.

Collection of material from commercial catches for the study of fluctuations in the stock of cod has been continued as in previous years; a total of 11,200 specimens have been measured and sex-determined, and 1100 samples of otoliths have been collected. The data collected during recent years have been prepared for publication.

Several samples of adult herring have been collected at various seasons in the fjords and on the banks in order to procure material for racial investigations. During the months of July and August several experiments were made with the drift-net in order to capture herring especially to the east and to

the north off the islands; on 20 occasions experimental fishing was carried out during the night, but the result was very poor, a total of about 250 herring only being caught. The experiments will be continued at a future date.

Iceland.

In the spring markings of cod were carried out off West-Iceland; as the fishery, however, was far below normal in all Icelandic waters the marking was not successful and only 266 specimens were marked, about 5 % of which have been recaptured.

During the year very few emigrants from Greenland have been reported as recaught in Icelandic waters, viz. 12 (see below).

As Denmark was unable to send a research vessel to the Icelandic waters during the year material of very much value to the continuous work in the area was, as mentioned above, procured by other sources. The Dutch vessel "Nautilus" worked in the area during the month of June (see below, Holland), and the English research vessel "George Bligh" carried out work in Icelandic waters between June 19th and July 13th (see below, England). During the circumnavigation of Iceland, trawling, pelagic hauls, hydrography etc. were carried out by the "George Bligh" at the fixed stations worked for several years by the Danish research vessel. During the 17 days on which weather etc. permitted work, more than 20,000 fish were measured, otoliths and scales taken etc. All material has been handed over to Denmark and will be included in the subsequent reports dealing with the different items.

The material of plaice has been treated and shows that the year-classes 1930 and 1931 predominated in the localities where trawling was carried out. The material of haddock has been passed over to Dr. Raitt, who has included it in his report on haddock investigations in North European waters.

The sketch map shows the stations taken by the two research vessels mentioned in the Icelandic area proper.

Mr. E. Bertelsen was engaged during July—August on work in the coastal waters of South-Iceland, where fishing experiments with eel hand seine and other implements were carried out and bottom sampling made in the fjords of South-East Iceland (Hornafjord, Skarðsfjord); the bottom material collected has been examined and the results published by Dr. Spärck (see list of papers below). During the fishing experiments valuable material of plaice and herring has been collected from this part of the Icelandic coastal waters, from where but few observations are available, primarily owing to the rather difficult access to this area.

The Danish and Icelandic fishery patrol vessels have, as in previous years, contributed to the collections especially by hydrographical observations.

"Fiskifélag Íslands" has continued work as in previous years (by Mr. Árni Friðriksson). Further, the patrol boat "Thor" was engaged on fishery research work between February 16th to 24th and June 20th to August 12th. The first cruise was made in order to find spawning herring; this was also the purpose of the spring cruise the year before. No spawning herring was found, however. On the summer cruise more general fishery investigations were carried out. Finally the patrol boat "Ægir" made some plankton collections in April.

The following research work was carried out:

Cod: 16,571 specimens from the commercial fishery and the cruises with the "Thor" were measured and 3,384 age-analyses were carried out. The dominating year-classes were 1922, 1924, and 1926, but only in the warm water areas, the best year-class being the one of 1924. The fishing-intensity at the Westmanna Islands was only 60 cod per 1,000 hooks, as against 110 in the previous year. No new year-class was observed on the spawning grounds. A greater amount of young cod of the year-classes 1930, 1931 and 1932 were met off the N. and E. coast than in any other year from which material has been available since 1928.

Herring: 35 hauls were made with the herring trawl (head line 90 feet) in the area between Portland and Faxabay (inclusive) from February 16th—24th. Later on (June 20th—21st), 5 hauls were made in the Faxabay, on July 12th, 2 hauls were made in Medallandsbay, and on July 23rd—24th, 4 hauls in Myrdalsbay and Medallandsbay. No spawning herring were found. 16 samples of herring, caught by trawlers (commercial otter trawl) in the warm-water areas during the month of April were examined (total number of specimens 1,445) with the following results: only 23 % were ripe, spawning and spent spring spawners, with an average length of 31·78 cm., almost 3 cm. less than the spring spawning herring usually caught off the N. coast during the summer-months. Some 11,000 herring have been measured, and a great part of this material has been investigated as to weight, maturity, fat and sex. Samples of scales were collected. Material is available from all parts of the coast between February 16th and September 24th. In the autumn-fishery at the SW. coast about 50 % of the stock was made up by summer spawners, while the summer fishery off the N. coast showed practically 100 % spring-spawning herring. Quantitative investigations on stomach content were carried out; about 900 stomachs were examined.

Norway Haddock. On the cruises with the "Thor" 9,795 *Sebastes marinus* (about 300 specimens of *S. viviparus* included) were measured. Several hundreds were weighed; analyses of stomach contents carried out, and about 500 otoliths collected.

Greenland Halibut. On the summer cruise 1,907 *Platysomatichthys hippoglossoides* were measured, and a great part of these were investigated as to stomach contents.

Other fish. More than 15,000 fish belonging to 50 species were measured, and partly investigated in other ways.

Stations round Iceland, Summer 1936.

"George Bligh" ◉ trawling. "Nautilus" ⊗ trawling.
● non-trawling. × non-trawling.

Prawns. More than 3,000 *Pandalus borealis* were measured, weighed and investigated with regard to maturity. *Pandalus* was found on the cruises at all parts of the coasts and at very varying depths. By comparing the mean weight in the different samples it was found that the mean weight increases with the depth. Thus, within 100 m. 3·6 gr., between 100 and 200 m. 8·4 gr., between 200 and 300 m. 11·8 gr. and at depths of more than 300 m. it averaged 12·6 gr.

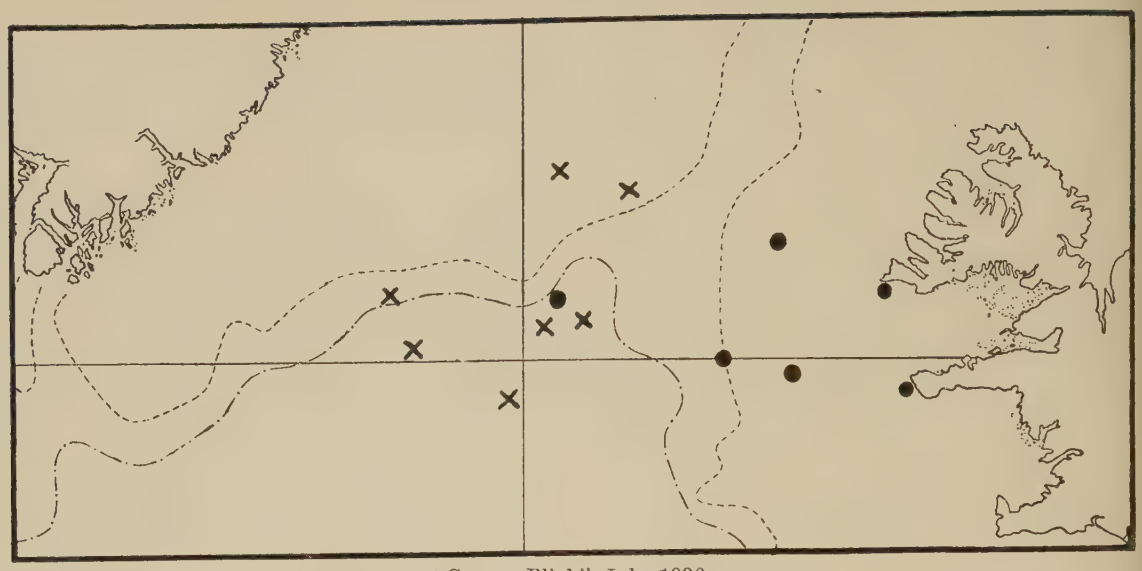
Norwegian Lobster. About 4,200 *Nephrops norvegicus* were measured and weighed.

Plankton: 36 plankton hauls were made with two 2 m. stramin-nets, 15 and 65 m. wire, in the area from Eystra Horn (SE. Iceland) to Straumnes (NW. Iceland) in the period April 8th to 29th in order to find herring larvae. Later on, June 20th to August 12th, 39 surface hauls were made with a 1 m. stramin-net at various localities. Finally, 78 hauls were taken with Prof. HARDY's "Plankton Indicator" at all parts of the coast.

Hydrography: Surface-temperatures have been measured at some 500 localities throughout the year, partly by the patrol boats, partly by fishing vessels. 14 vertical sections of temperature measurements were made on the cruises at different parts of the coasts.

Denmark Strait.

Early in July the English research vessel "George Bligh" carried out investigations in the Denmark Strait. Several pelagic hauls and hydrographic obser-



"George Bligh" July 1936.
● Cod larvae present. × No specimens.

vations were made in the area between North-West Iceland and the limit of the drift-ice in the strait in order to see wether the drift of cod larvae was of any importance; no evidence, however, as to any strong westerly drift of cod larvae was observed this year (see the above chart).

Greenland.

West Greenland: Professor Ad. S. Jensen, fishery adviser to the "Grønlands Styrelse", has given the following survey of the work carried out in the coastal waters of West Greenland during 1936.

Fisheries investigations have been carried out by Magister Paul M. Hansen during the months: May to October from the M/B "Umarissok" along the coast from 64° N. Lat. to 71° N. Lat. Pelagic hauls with a 1 m. stramin net have been made in the entire area at various localities for the study of the distribution of fish larvae.

556 cod have been marked, about 150 of which during the month of May in the Godthaabsfjord and some 400 in North Greenland, particularly in the Egedesminde District, during September.

At the different fisheries stations in 8 colony-districts a material comprising some 5,000 otoliths of cod with measurements and sex determinations have been collected at different periods of the season.

The youngest year-classes of cod have been searched with the eel hand seine at several localities all over the investigated territory.

378 halibut otoliths with measurements have been collected at the fisheries stations of Kangamiut and Holsteinsborg in order to study the age and growth of this species and to follow the age composition of the stock.

Fishing experiments have been carried out, chiefly in the Umanakfjord, for Greenland halibut. 262 specimens were marked in the Godthaabsfjord, the Umanakfjord and off Jakobshavn. Out of the specimens marked during 1935 off Jakobshavn (about 400) 17·6 % have been recaptured up to now. All Greenland halibut, which during the fishing experiments were captured but could not be used for marking, have been measured and weighed, scales and otoliths were taken from about 600 specimens.

During the fishery for *Pandalus* in Amerdlokfjord at Holsteinsborg codling, Greenland halibut, *Sebastes*, *Lycodidae* and *Liparidae* have been collected with different invertebrates for closer investigation at a later date.

Material of the capelin (*Mallotus*) has been procured from the Godthaabsfjord and the Umanakfjord; measurements and weighings have been made, otoliths for age determinations have been collected, and countings of vertebrae for racial investigations have been carried out.

As to the Uvak (*Gadus ogac*) material of otoliths with measurements and sex determinations from a total of 220 specimens have been collected in the Godthaabsfjord and the Umanakfjord. Furthermore, countings of vertebrae and D_2 for racial investigations have been carried out on about 100 specimens caught in the Umanakfjord.

From the Sukkertoppen a sample of some 200 scales and measurements of herring has been collected.

In several localities, especially in North Greenland, fishing experiments with long lines for the Greenland shark (*Somniosus*) have been made; 156 specimens have been measured during this work.

For the first time marking experiments on e Greenland shark have been carried out. 50 cimens were marked and liberated in the Umanak-rd and at Rodebay in the Diskobay. The marks re of the same type as those used in marking enland halibut; the mark was fixed just posterior the eye of the shark.

Measurements of the temperature down to a th of 300 m. have been carried out in several alities all over the investigated area.

On the offshore banks marking of some 300 l has been made from a Faroe cutter, and further-re 2,000 measurements and 300 otoliths of cod have n secured from various localities on the offshore nks.

The emigration of cod from Greenland waters to land has not been so extensive as in previous years, iging from the number of recaptures; only 12 cimens have been recaptured at Iceland compared th about 50 specimens per annum in the five vious years.

Whales. In 1936 20 whales were caught at Green-nd by the Danish whale boat "Sonja" (15 fin ales and 6 humpbacks).

At the Faroes Lopra Whaling Station (3 whale ats) and Thorsvig Station (2 boats) 94 whales 2 fin whales, 1 sei whale, 2 blue whales and 9 sperm hales) were caught during 1936.

England.

From June 11th to July 21st, 1936, the research ssel "Georg Bligh" was engaged on a cruise to eland and the Denmark Strait, in order to maintain e continuity of the Danish work, which would herwise have been broken by the loss of the Dana II". An English naturalist was in charge of e work but the programme was drafted by Den-ark, in consultation with the English Department, d three Danish scientists came on the ship. All cords and specimens were taken to Denmark. See rther above. (F. M. Davis).

France.

No research vessel has been working in the area uring the year; several observations were procured, owever, by the "Ville d'Ys" and by other means; the Appendices (this Vol. part III, 1) M. le Com-andant L. Beaugé has given a short review of search work carried out in the North-Western Area nd in Newfoundland waters during the years 1934—936. (Ed. le Danois).

Germany.

The "Hydrobiologische Abteilung des Zoologischen aatsinstituts" in Hamburg has carried out the llowing investigations:

Professor E. Hentschel investigated the stomach ntents of herring landed at Siglufjörður (North eland) between July 12th and August 11th in order to study the distribution of the plankton in the North-Icelandic waters. Numerous catches of herring from the area between Horn (Cape North) and Langanes were investigated immediately on landing and a material comprising 171 samples was preserved for closer study at a later date. Several samples of surface water (each of 5 litre) procured by the fishermen from the fishing areas were filtered through gauze of phosphorous bronze to obtain the content of microplankton. This method was also used in collecting plankton samples during a cruise of the fishery patrol vessel "Thor" to Kolbeinsey and back under the supervision of Magister Árni Friðriksson. Moreover, every day similar samples were taken in the Siglufjörður itself and small quantities of living nannoplankton were studied daily, quantitatively, by a new method. Numerous 5-litre samples of surface water were taken and filtered during the voyage to and from Iceland with the S/S "Dettifoss"; most frequently the samples were taken every hour or every half hour during the voyage, and they were procured on the route Orkney Islands — Vestmanna Islands — West Iceland and along the western part of the north coast of Iceland.

The "Arbeitsstelle für Fischereiforschung der Staatlichen Biologischen Anstalt auf Helgoland und des Instituts für Seefischerei in Wesermünde" (Dr. Lundbeck) has carried out the following work in the area:

The study of the statistics of market landings from German fishing vessels working at Iceland has been continued as in previous years. Moreover, the Iceland landings were investigated in connexion with individual weight determinations; by this method a fairly large material of measurements is available and will now be procured regularly.

The material mentioned below was collected:

	No. of samples	No. of specimens	Weight in kg.
Cod	18	4,944	19,143
Haddock.....	14	4,473	7,602
Coalfish.....	3	644	2,626
Norway Haddock.	8	806	861
Other species.....	95	6,898	12,944
Total...	138	17,765	43,176

As to the fishery it is necessary to emphasize, that the total catch of cod in the spring of 1936 was much below normal (about half), and the summit of this fishery occurred later than normally.

(A. Hagmeier).

Holland.

The "Nautilus" carried out hydrographical and biological work at the Faroes and Iceland during May—June 1936. Hydrographical surface samples were collected from the Shetland Islands to the Faroes and from there to Iceland. Around Iceland samples were taken at various depths, circumstances permitting, at the usual fixed "Dana" stations.

Some trawlhauls were made at various stations round Iceland. By stress of weather it was impossible to work all the regular "Dana" stations. The catches, each of 2 hours duration with an ordinary commercial otter trawl (foot rope 120 feet, meshes in the cod-end 5—5·5 cm. from knot to knot), were analysed, the principal kinds of fish being measured; otoliths or scales were not taken.

At most of these trawl stations and at some other localities on the south-east coast of Iceland plankton samples were taken in the surface waters. The net used was a 1 m. young fish trawl borrowed from the "Marinbiologisk Laboratorium" in Copenhagen; all hauls were of 10 minutes duration and were made, as mentioned, in the surface waters. The fish eggs and larvae procured were sent to Copenhagen for further examination. (J. J. Tesch).

Norway.

During the year the surface thermograph service of the "Fisheries Directorate" on the two Norwegian liners S/S "Lyra" and S/S "Nova" was continued between Bergen and Reykjavik, the first mentioned on the line Bergen—Faroe—Reykjavik, the last mentioned from Bergen *via* Faskrudsfjord and North Iceland to Reykjavik.

Two papers have been published relating to work carried out in previous years, see list of literature below. (Oscar Sund).

Scotland.

Work at Sea.

The Scottish research vessel operated in the Faroe-Shetland area during the first half of June 1936. The stations and profiles of the cruise were arranged as in the corresponding cruise during June 1935, but the order of working the stations was reversed, departure being made from the Butt of Lewis to Faroe Bank and Syderö and the return journey from Nolsö across Sandö Bank to Flugga. Operations were also conducted at a representative series of stations round the Faroes. The main objects of the cruise were as follows:—

1. Survey of the fishing grounds on Faroe Bank and at the Faroes, with special reference to the haddock populations.
2. The prevailing hydrographic and planktonic conditions.
3. Marking experiments on cod (on Faroe Bank) lemon soles and skate.
4. Distribution and frequencies of occurrence of clupeoid larvae.

Hydrography

The temperature and salinity data will appear in the Bulletin Hydrographique. A detailed account of the Scottish observations will be found in the report of the Hydrographic Committee.

Surface drift bottles were liberated at all stations on the cruise.

Plankton.

No salps or doliolids were observed in any of the collections taken throughout the cruise. During the previous month (May) *Calanus* and *Limacina* occurred in dense patches on the plateau to the north-west of Scotland. In the region of Wyville-Thomson Ridge in June, *Calanus* was much reduced in numbers and *Limacina* had practically disappeared. Between Halibut and Faroe Banks the collections were of a very mixed nature, including *Calanus finmarchicus* and *hyperboreus*, *Rhincalanus*, *Eucalanus*, *Euchaeta*, *Sagitta lyra* and *serrato-dentata*, *Cosmetira megalotis*, *Agalmopsis elegans*, *Limacina helicina* and *Phaenna spinifera*. On the northern line of stations between Nolsö and Flugga, *Calanus finmarchicus* was much more abundant. *C. hyperboreus*, *Cosmetira* and *Euchaeta* were generally present, but few in number, as were *Rhincalanus*, *Eucalanus* and *Galiolaria* on the Shetland side of the Channel. On the plateau close to the Shetlands, *Beroë* and *Hybocodan* were found in fair numbers.

The original Hardy Plankton Indicator was worked continuously by alternate hauls of two machines between the Butt of Lewis and Faroe Bank and between Nolsö and Flugga. A report on the collections will appear in due course.

Clupeoid Larvae.

Clupeoid larvae were again secured at the Faroes. Positive hauls were obtained at the following stations:

XX 17c 59°00′ N. 6°40′ W.,
WW 18b 59°56′ N. 7°27′ W.,
XX 21a 61°17′ N. 6°58′ W.,
XX 22d 61°32′ N. 6°28′ W.,
XX 22b 61°45′ N. 6°26′ W.,
YY 22a 61°54′ N. 5°45′ W.,
XX 23d 62°00′ N. 6°12′ W.,
WW 23b 62°24′ N. 7°07′ W.,
WW 22b 61°46′ N. 7°11′ W.

Larvae in these hauls were few, less than 10 per unit haul, except at the station east of Nolsö in 62°00′ N. 6°12′ W. where the mid-water and bottom nets (diameter 1 metre) secured 66 and 178 respectively for a period of fifteen minutes. For the second year in succession, a few Clupeoid larvae were obtained in the region immediately SW. from the Wyville-Thomson Ridge. These had most probably drifted from the Hebridean coast.

Trawling.

Trawling observations were carried out on Faroe Bank and round the Faroes. No cod were secured in the hauls taken on the eastern edge of the Bank so that the desired marking could not be done. Cod, however, were fairly plentiful at the Faroes and a total of about three hundred collected from the various trawling stations was marked and liberated. Marking of lemon soles was also carried out and about one hundred fish from the Faroe hauls were so treated.

ddock.

The Faroe hauls gave an average of 450 haddock unit of fishing time — one hour. The year-class 5 predominated, constituting about 92 % of the ual catches. This brood was also abundant in the rth Sea. This feature, however, is not a normal urrence in separate stocks although a similar pening was observed in 1929 in the case of the eptionally abundant year-class 1928. The abunnce of these one-year-old haddock and the small mber of hauls taken in the Faroe area seem to ve masked the relative frequencies of the older ar-classes.

The Invertebrates caught in the trawl hauls were ntified and records kept for faunistic purposes.

(R. S. Clark).

Sweden.

No work has been carried out during 1936.

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PLATEAU CONTINENTAL ATLANTIQUE ET COMITÉ ATLANTIQUE

1936.

Par

Ed. le Danois.

A. Plateau Continental Atlantique.

Les évènements d'Espagne ont apporté une sérieuse perturbation dans l'activité du Plateau Continental Atlantique. Ces évènements nous ont non seulement privés de la collaboration de nos Collègues Espagnols, mais, de plus, ont eu une répercussion indirecte sur les recherches effectuées par le Gouvernement Portugais.

Depuis 1935, la situation difficile de certains États représentés dans le Comité du Plateau Continental Atlantique a empêché la publication d'un rapport annual faisant suite à la série qui, commencée en 1920, ne subit aucune interruption jusqu'à 1934. La réunion des experts sur les méthodes à employer pour l'étude de la sardine qui devait avoir lieu en 1936 a dû être ajournée par suite des évènements actuels.

Nous pouvons résumer comme suit les recherches effectuées pendant l'année 1936 dans la zone d'études du Comité du Plateau Continental Atlantique:

Espagne.

Aucune croisière.

Toutefois en 1935, MM. Rafaël et Fernando de Buen avaient remis à la séance du Comité du Plateau Continental des travaux destinés à l'impression dans le rapport de ce Comité. Ces mémoires concernent des recherches effectuées dans le Détroit de Gibraltar et sur la côte nord d'Espagne; ils sont donnés dans le Rapport Atlantique de cette année, Rapp. et Proc. Verb. Vol. No. 104, comme contribution du Gouvernement Espagnol.

France.

Dans la zone d'études du Comité et dans les eaux adjacentes, un certain nombre de croisières ont été effectuées. Le navire "Pourquoi-Pas?", comme chaque année, traversa le Plateau Continental pour se rendre au Groënland et en Islande. C'est au cours de cette croisière que ce navire, dont la réputation était universelle à la suite de ses nombreuses expéditions dans les mers arctiques et antarctiques, se perdit sur les côtes d'Islande, où le Grand Savant et Navigateur Français J. B. Charcot trouva une mort glorieuse avec la Mission scientifique et les membres de son équipage.

L'aviso de la Marine Nationale "Ville d'Ys" a effectué des observations hydrologiques dans l'été 1936 sur les Bancs de Terre-Neuve et au Groënland; une partie de la documentation recueillie a été communiquée au Comité du Nord-Ouest Atlantique.

Enfin, le navire de l'Office des Pêches Maritimes "Président Théodore Tissier" a accompli deux croisières de Mai à Septembre, ayant été armé pendant 6 mois sans interruption. La première de ces croisières a eu pour but l'étude de l'Atlantique sub-tropical au large des côtes d'Afrique et jusqu'aux Açores, la seconde croisière a eu pour objectif l'étude du Plateau Continental Franco-Britannique et la Mer du Nord. Nous fournissons sous forme d'un rapport annexe quelques remarques sur les résultats obtenus par ces croisières dans la zone d'étude du Comité.

Les avisos de la Marine Nationale "Quentin-Roosevelt" et "Ailette" ont également apporté une utile contribution aux recherches du Comité au cours de leur sortie dans la région sud-ouest des Iles Britanniques.

Grande-Bretagne.

Le navire de recherches de la Marine Biological Association de Plymouth a effectué des sorties régulières mensuelles à l'entrée de la Manche occidentale.

D'autre part, le Service des Pêcheries d'Angleterre, en la personne du Dr. Hickling, a poursuivi des études sur la sardine de la Cornouaille Anglaise.

État Libre d'Irlande.

Par suite des restrictions dans le personnel scientifique, la contribution de l'État Libre d'Irlande aux recherches du Comité s'est trouvée réduite en 1936.

Le navire "Muirchu" a effectué trois croisières:

en mars (sur la côte nord d'Irlande)
en mai (sur la côte sud)
en août (sur la côte nord).

Portugal.

Malgré des difficultés le navire "Albacora" a pu faire de nombreuses et courtes sorties au large des côtes du Portugal dans les mois de Mai, Juin, Juillet,

ût, Septembre, Octobre, Novembre et Décembre. s résultats hydrologiques obtenus ont été com- niqués directement par le Dr. Ramalho au Bureau ntral de Copenhague.

De plus, les études suivantes ont été pratiquées: rquage de thons en Algarve en 1936: 51 exem- ires de 60 cm. à 150 cm. de longueur, ce qui porte 58 le nombre de thons marqués à partir de 1931. cune recapture n'a été signalée jusqu'à ce moment. Recherches sur les fonds chalutables (par les alutiers à voile) de la Baie de Lisbonne (observa- ns sur la taille des jeunes merlus, soles, etc.).

B. Comité Atlantique.

Le rôle de liaison du Comité Atlantique s'est rticulièrement affirmé en 1936. En effet, il faut peler que c'est à l'instigation de ce Comité que entreprise l'étude générale des variations de bondance des classes de certains poissons comestibles s deux côtés de l'Atlantique. Le Conseil Inter- tional a consacrée une partie de ses discussions entifiques, dans sa réunion annuelle, à l'examen cet important problème et les résultats obtenus t fait l'objet d'une publication spéciale du Conseil. Nous ne possédons pas encore les rapports des écialistes Américains qui ont traité cette question ns l'Atlantique occidental.

Le Conseil International des Pêcheries de l'Amérique du Nord s'est réuni à New-York du 23 au 25 Septembre 1936, sous la présidence du Dr. H. B. Bigelow et le Professeur J. Hjort, Vice-Président du Conseil International pour l'Exploration de la Mer, a été l'hôte de ce Conseil.

Depuis 1935, cette Assemblée Scientifique, par suite de son développement, a constitué dans son sein un certain nombre de Comités comparables à ceux existant dans le Conseil International pour l'Exploration de la Mer; ces Comités sont les suivants: Comité hydrographique, Comité des poissons de fonds, Comité des poissons pélagiques, Comité des poissons côtiers, Comité statistique.

Parmi les nombreux travaux en cours il faut signaler qu'à l'instigation du Gouvernement du Canada et des États-Unis le Conseil a examiné l'application d'une convention pour le chalutage de l'églefin fixant la dimension des mailles de chalut destinés à la capture de ce poisson.

De plus, le Comité hydrographique a décidé la publication annuelle des résultats obtenus au cours des croisières.

Le Comité des poissons de fond entreprend une étude sur les merlus par la méthode de marquage et d'examen des écailles.

Le Comité des poissons pélagiques est décidé à entreprendre une étude systématique du maquereau et du hareng au large des côtes des États-Unis et du Canada.

COMBINED NORTH SEA AND EASTERN CHANNEL COMMITTEE

1936.

By

G. Gilson.

tatements of the work carried out during the ear are included in the reports of the several ountries engaged in particular researches in the uthern part of the North Sea. Plankton collecting, ydrographical observations, herring and sprat work, sh larvae, and the vitality of young fish were the rincipal objects of sea work and laboratory activity the region. As usual a great wealth of data have een collected and will be some day of great use to s in our efforts towards the solution of many questions f oceanography, biology and fishery.

Meanwhile, however, it appears every day more desirable that simultaneous observations of all kinds be periodically made on certain affixed lines in the sea, and that the results of an immediate analysis of samples and of the computation of figures be promptly obtained.

On the other hand, the task of organizing simultaneous work and of putting into action a centralizing mechanism, both for analysis and for computation, appears more and more difficult as the weight of current laboratory work is continuously growing

heavier and research labour more exacting to all of us. In the face of these difficulties, it seems advisable to reduce our programme to an extreme simplicity.

For instance the analysis of plankton samples could be reduced to an estimate of the abundance and the relative proportion of the ten species of diatoms and perhaps the ten forms of copepods that are considered the most important in the region, with a merely qualitative mention of the occurrence of bigger forms, of all kinds, which can be identified at first sight. Special attention should be paid to fish eggs and larvae, as well as to all kinds of animal life both planktonic and semi-planktonic that have been stated to remain sometimes, temporarily stagnant, close to the sea bottom.

Systematical cruises, fragmentary as their series might be, can never fail to present some interesting features and data, tending to a better comprehension of the normal and abnormal variations in the physical and biological conditions of our sea. It would be practical, even for very incomplete series of observation to plot the results on the special charts and vertical sections, printed by the Royal Museum of Brussels; these will be given away freely on demand addressed to the Bureau of the Council.

Belgium.

Continuation of work as in the preceding year. New season of the annual concentration of pure spent herrings along the coast; seventh year of systematical observation of daily samples; addition of the step 1936—37 to the biological scale. Remarkable poverty of the class 1933, noticed also by the Dutch observers for non-coastal communities. Monthly cruises with the fishery surveying ship on the line Deal—Gravelines; four hydrographical and planktonic stations; vertical plankton hauls and samples of water for salinity and temperature, from bottom to surface. Herring larvae abundant in January and February near the continental coast. Special net of stramine used for catching larger masses of plankton, not quantitative; fish larvae; glass eels; 2 *leptocephalus morrisii*. Lightship West-Hinder: meteorological observations and surface temperature three times daily. Weekly: vertical plankton hauls and samples of water, bottom to surface.

Other work continued: sprat fishery and biology, scales, food, etc. Shrimp fishery research continued. — Laboratory work: food of fishes, parasites, fauna.

The work was greatly hampered by the want of a ship and the reorganisation of the Institute.

England.

For the work done in the intermediate region, see the report of the Southern North Sea Committee. Besides, investigations have been carried out on the following objects: Herring larvae from the three lightships Varne, Sandettié and Galloper. Vitality of fish caught in the trawl, special interest being given to the experiments on small fish. Sprat investigations of six years worked out and soon to be published; scales, food. Hydrographical and plankton data in Hydrographical and Plankton Committees.

France.

See report of Southern North Sea Committee. Hydrographical data from England, France and Holland. Quantities of plankton samples collected in the region. General scarcity of plankton noticed during the cruise of the research ship "Président Théodore Tissier". Continuation of herring research in the Channel and in the Flemish Sea.

Germany.

Cruises of the fishery patrol vessel "Elbe". Researches on the distribution of fish larvae with hydrographical and plankton observations, conditions differing from those observed last year: important quantities of herring larvae further south: Boulogne — Dyck — East-Goodwin — but few on the grounds between the Channel and the Hinder. Surface temperature notably lower.

Crossing of the Flemish Sea on Lat. 52° with 5 hydrographic and plankton stations that could be plotted on the line Maas—Shipwash of the chart and sections printed by the Brussels Museum. Other work recorded in the report of the Southern North Sea Committee.

Holland.

Hydrographical and plankton observations included in the report of the Southern North Sea Committee. Herring work continued in Flemish Sea and further south in the Channel: length, maturity, vertebrae and age. Very striking deficiency of the age-class 1933 just appearing in 1936—37.

NORTHERN NORTH SEA COMMITTEE

1936.

By

Robert S. Clark.

troduction.
I. Work at Sea.
II. Hydrography.
II. Plankton.
IV. Fisheries (a) Ichthyometrics.
(b) Fishing Technique.
V. Fish (a) Herring.
(b) Haddock.
(c) Plaice.
(d) Lemon Sole.
(e) Megrim
(f) Mackerel.
VI. Shellfish — (a) Lobsters.
II. Bottom Fauna.
III. List of Scottish Papers published during the year on work within the area.

INTRODUCTION

The investigations in the area of the Northern North Sea during the year 1936 were continued nd extended on much the same lines as in previous ears. With the possible exception of Denmark, for easons explained elsewhere, all countries represented n the Committee contributed in some way or other o the general scheme of work. Six different research essels operated for longer or shorter periods within ne area, while limited observations were carried out rom Protection Ships and on board commercial essels.

The Atlantic influx is probably the most significant eature of the **Hydrography** of the Northern North ea. Maximum intensity usually occurs in April but 1 1936 it was not until the latter part of July and roughout August that the most striking variation the conditions was observed. Normal summer onditions occurred even in October, while the water emperatures were unusually high up to the middle f December. Abnormally high salinities were not ecorded as in 1935. Apart from these changes, the ear was not marked by any outstanding hydro-raphic feature and the pulsation of Atlantic water as decidedly less intense than in the previous year. he relatively weaker influence and the lateness in its arrival was confirmed by the results of the surface drift bottle experiments. In June and July an offshoot from the main south-going stream which is shouldered off round the north-east corner of Aberdeenshire appears to have set in towards the Scottish east coast, as large numbers of surface drift bottles liberated off this part of the coast passed into the Forth estuary. In August and September, however, few recoveries were made from British coasts, while no strandings from liberations during the period October to December have so far been recorded from Scottish or English coasts.

The variation in the hydrographic conditions was reflected in the composition of the **Plankton**. The distribution of Calanus in 1936 resembled generally that of other years but the maximum catches were relatively later in making their appearance in the northern area. Salps and doliolids were not observed in the North Sea collections but their absence may not be due altogether to weakness in the pulsation of Atlantic water into the area. The most striking feature of the movements of the water masses was the relative scarcity of herring larvae in the Forth estuary during the late autumn months. The autumn spawning grounds are situated off the Scottish east coast from Rattray Head southwards and the chief hatching period falls normally in September month. The pelagic fry are carried passively by the prevailing currents and the scarcity of larvae in the Forth estuary suggested that some variation in the position and extent of the Forth swirl had transported the larvae beyond this region. Observations in October south of the Forth confirmed this surmise, for large numbers of larvae were obtained between the Berwickshire coast and the Dogger Bank.

Morphological studies of the **Herring** have yielded results of considerable importance regarding the distinguishing characters of the main herring groups in the Scottish area. These are outlined in a paper (VIII, 7) on "Race Investigation of the Herring Population of Scottish Waters". The analysis of the summer herring shoals during 1936 brought out a predominance of four- and five-year-old fish, the

younger group being the more numerous. Fish of the 1928 year-class still formed about 40 % of the catches at the spawning season. The trawled herring of the Fladen area showed during the latter part of the season a higher percentage of autumn spents than during the last few years. The good prospects predicted for the Forth spring fishery were fully realised, five-year-old fish (year-class 1931) being again prominent in the catches, but, as expected, the Clyde catches throughout the summer and autumn were poor.

The forecast in last year's report as to the future yield of the **Haddock** stock of the area was fully confirmed by the results of the research vessels and by the statistics of the commercial landings. While the 1935-brood predominated in the North Sea and formed over 90 % of the catches, older haddock were very scarce in that area, but representatives of the 1928 and 1931 year-classes still persisted to the north and north-west of Scotland. The brood of the year (1936) appears to have been less successful but the relative strength of its recruitment cannot be determined until the spring to summer period of 1937.

Continuity in the work within the area was maintained and a series of papers of wide range has been published. It has not been possible, however, to carry out the recommendation passed at last year's meeting of the Committee that a separate report of investigations within the area should be compiled since this would have involved wasteful reiteration of many matters published in other reports.

The experience of past years suggests that more use might be made of co-operation between the nations for the solution of particular minor problems in which a particular nation is interested. I instance the willingness of the Swedish scientific staff to make, at our request, a special effort to obtain herring larvae during the winter months, which should aid materially in a solution of the problem of the drift of immature forms and the readiness of our English colleagues to hand over for analysis their haddock data. On many occasions, without interfering with the routine programme of a cruise, additional or supplementary collections could be made which might further some particular investigation and I would suggest that an effort be made to further co-operation along these lines by free inter-communication of needs and requests between one nation and another.

The reports on work done within the area by the participating countries were transmitted by their representatives on the Committee. The contributions by Scotland were compiled from investigations carried out by members of the Fishery Board's scientific staff.

I. WORK AT SEA

Denmark.

The new research vessel was still in process of building and in consequence no sea work was undertaken during the year.

England.

The research vessel "George Bligh" visited the Forth area in September and liberated marked plaice transplanted from the Southern North Sea from the vicinity of the Norfolk coast. Trawling operations were also carried out on the Scottish east coast and the survivors of plaice caught and marked in this region were released off the Norfolk coast.

France.

May to August. Surface hydrographic and plankton observations were made on sections of the area crossed by the fishery patrol vessel "Ailette" during passage to the Iceland and the Murman coast cod fisheries.

June to September. Serial hydrographic and plankton observations were carried out during a survey of and on passage to the herring fisheries off the west coast of Scotland, around the Shetlands and on the Fladen ground.

August. Serial hydrographic and plankton observations were made on the cruise of the research vessel "Président Théodore Tissier" which embraced the north coast of Ireland, the west and north coasts of Scotland, the Shetlands, Northern North Sea, Fladen and the Gut. Trawling and dredging operations were also carried out.

Germany.

Experiments with an Echo Sounder and a new Plankton apparatus were carried out on commercial vessels in the Northern North Sea.

Holland.

Hydrographic observations were made around Fair Isle, at the Shetlands and between the latter and Bergen during the summer/autumn cruise of the fishery patrol vessel "Nautilus".

Norway.

The Fisheries Directorate, by means of the research vessel "Armauer Hansen" which was hired from the Geophysical Institute, Bergen, executed an oceanographical survey of the Northern North Sea from April 20th to May 9th. This survey comprised 98 stations on five traverses of the northern area between Norway and Scotland approximately at the following latitudes.

Latitude (approx.)	Date	No. of Stations	Distance (miles)
1. 61°40′....	May 8th	9	100
2. 60°45′....	April 12th—23rd	17	160
3. 59°50′....	May 4th—6th	16	175
4. 58°45′....	April 27th—29th	23	250
5. 57°40′....	May 2nd—3rd	18	220

Similar observations were also made at a few stations between Sumburgh Head and North Ronalds-

ay on April 27th, Stronsay and Peterhead on May 3rd, nd south-west from Egersund on May 1st. Earlier n the year, some Norwegian coastal work was carried ut at 42 stations by the "Armauer Hansen" and the Johan Hjort".

cotland.

The following is a summary of the cruises of the esearch vessel "Explorer".

larch:	Northern North Sea — north-western sector including Moray Firth.
	West of Shetland and Orkneys.
	North of Scotland and Minch.
pril:	Northern North Sea.
	Aberdeen — Lerwick.
	Shetland — Norway traverses.
lay:	Middle North Sea.
	Aberdeen — Gut — Forth.
une:	Moray Firth.
	North of Scotland plateau.
	Butt of Lewis — Faroe Bank — Faroe.
	Faroe — Shetland.
	West Shetlands — Fair Isle — Aberdeen.
uly:	Pentland Skerries — Cape Wrath — Minch.
	West Hebrides.
	Barra — Inishtrahull — Clyde.
ugust:	Clyde estuary.
	Inner Hebrides.
	Minch — Fair Isle — Bressay Shoal.
	Bressay Shoal — Aberdeen.
eptember:	Northern North Sea — Scottish coast to longitude 2° E.
	Middle North Sea.
	Scottish East coast to Great Fisher and Ling Banks.
ctober:	Aberdeen — Dogger Bank — Forth.
ovember:	Moray Firth — Orkneys.
ecember:	Moray Firth and East Scottish coast.
	Coastal survey.

General hydrographic, planktonic and trawling bservations were carried out only by the research essel "Explorer" at fixed stations on all the cruises, s the motor boat "Enid" was out of commission uring the year. Trawling operations were made with n otter trawl of commercial size and standard mesh, he cod-end of which had a covering of small-meshed etting to retain the smallest sizes of haddock and hiting. The main object of these trawling surveys a investigation of the haddock stocks, but attention a given to all constituents of the trawl hauls and pecially whiting, lemon soles and plaice. Observaons on the influx of Atlantic water into the area ere continued, temperature and salinity data being pplemented by surface drift bottle experiments. nvestigations on the location of the spawning rounds, their productivity and the dispersal of the rvae again formed an important branch of the work. The food of the pelagic fish fry is receiving close attention.

Plankton studies are being continued on much the same lines as in previous years in their relation on the one hand to hydrographic conditions and on the other to the food of fishes.

II. HYDROGRAPHY

France.

Temperature observations and water samples were taken at various depths during the cruises of the fishery patrol vessels "Ailette" and "Quentin Roosevelt" and during the cruise of the research vessel "Président Théodore Tissier". Particular water strata were examined on the cod fishery grounds, on the drift-net areas and on the herring trawling grounds. The general impression from the observations in July—August was that the surface temperatures were 1° higher than the corresponding mean of all the stations examined. The influx of Atlantic water with salinity greater than 35 $^0/_{00}$ was evident in the Fladen and equally in the lower strata of the Gut up to the latitude of the Dogger Bank.

Holland.

The usual hydrographic observations were carried out by the "Nautilus" during the early autumn between the Shetlands and Norway. These are reported elsewhere.

Norway.

On the cruises in the Northern North Sea the number of temperature and salinity observations amounted to 1,113. 270 oxygen and 250 pH observations were also taken.

The thermograph service between Bergen and Newcastle, Stavanger and Rotterdam and the two services to Iceland were continued as in former years.

Scotland.

A summary of the general conditions prevailing in the area appears in the report of the Hydrographic Committee. Some of the more general features of the surface drift bottle results may be gathered from the limited number of recoveries up to date. A definite concentration of strandings took place in the Skagerak area and along the southern Norwegian coast towards the end of the year of bottles liberated in almost every month. Several bottles liberated off the north of Scotland and in the Minch in March and May were recovered from the Orkneys. Liberations off the east coast of Scotland out to 1° W. in June and July indicated a set of the currents towards the Scottish coast as the bottles liberated in this area within the East Scottish Bight passed into the Forth estuary. After August, however, there was a scarcity of British coast strandings from liberations in the Moray Firth and mid-east Scottish area. None of the bottles liberated from October to December off the east Scottish coast out to longitude 1° W. has so far been recovered on the Scottish or English coasts.

III. PLANKTON

France.

A preliminary study only was made of the collections taken in the North Sea by the "Quentin Roosevelt" and "Président Théodore Tissier". The principal species were determined and quantitative estimations made. The species were those usually encountered in the area but the quantities of plankton collected in hauls of twenty minutes' duration by the large Schmidt tow-net were relatively very poor.

Germany.

A comparative study between the plankton catches and the stomach contents of herring was inaugurated and continued during the year.

Norway.

During the spring cruises from April 20th to May 9th forty-five surface hauls were made with the one-metre tow-net (0 silk) and thirty-nine vertical hauls with a tow-net (silk 8) ·72 cm. in diameter. This material has not yet been worked up.

Scotland.

A comparative study has been made of the plankton collected in the Northern North Sea during the last three years by means of the Hjort fine silk tow-nets. Volumetric analyses of the collections, exclusive of large forms such as jellyfishes, indicated that the high volumes of plankton were due largely to the abundance of the Copepod **Calanus**, though other species of Copepods were well represented in the collections. The phenomena observed over the last three years show a definite relationship to the incidences of Atlantic water in the Northern North Sea. In 1934 the Atlantic inflow made itself felt as early as March and in that year quite a rich plankton was already being encountered at that time. In the following year, however, when the incidence was weaker and did not reach its maximum until about June, the March plankton was much less abundant, while the greatest volume was observed in June. The maximum influence of Atlantic water in 1936 was even later, not occurring until July, and the plankton volumes also reached their peak about this time. The distribution of Calanus in 1936 resembled generally that of other years. The chief concentrations were in the northern part of the North Sea, and as a general rule this important food constituent is more abundant in the northern and western parts of the North Sea than in the southern and eastern sector. Other species, however, are always present and like Calanus, increase in numbers in the spring of the year.

The work with the Hardy Plankton Indicator in the North-Western North Sea between March and May has shown that the region is subject to extreme patchiness in distribution at the limited level which the apparatus investigates. Phytoplankton, as well as zooplankton, has been studied in this respect, and in relation to hydrographic conditions.

In the report for 1935, it was stated that phytoplankton was more abundant east of the prime meridian in the spring months and that the younger stages of Calanus were encountered more in the eastern half of the Northern North Sea, while the older stages were concentrated in the western sector. It is probable, therefore, that the older stages in the spring months were winter-carry-over stock retained in the east Shetland swirl and that the young stock farther east had been recruited largely from the Norwegian Deep where a large indigenous Calanus population is known to occur. Similar results were obtained during the spring of 1936 with the help of the Plankton Indicator. Recruitment, however, from the Atlantic also takes place round the north of the Shetlands, and as there is a definite retrogression of the surface currents in the region of the Norwegian Deep, it is reasonable to assume that the current system, as defined in this area, has a direct effect on the dispersal of these important food organisms.

Atlantic Species in the North Sea. Salps and doliolids, passive pelagic forms which are occasional immigrants from the warmer waters of the Atlantic into the Scottish area, were not observed during the year in any of the plankton collections taken along the west coast of Scotland, in the Faroe-Shetland Channel, or in the North Sea. One important exception, however, was observed in July at St. Kilda when a few salps, including a species not recently recorded from Scottish waters, were secured. A special study of these forms in the collections over the last sixteen years has shown considerable variation from year to year in their occurrence, in time of appearance, in actual numbers and in the routes traversed. The species have now been identified and the data have been collected with a view to correlation with hydrographic conditions. Three species of salps have been identified, the commonest being *Salpa fusiformis*, but the doliolids seem to be represented by a single species *Doliolum* (*Dolioletta*) *gegenbauri*. During the sixteen years from 1920 to 1936, salps entered the Northern North Sea on nine and doliolids on five occasions. The peak years were, for salps, 1920 and 1925 and for doliolids, 1928. The significance of the results will be seen more clearly when they are correlated on the one side with the physical conditions of the sea and on the other with the distribution and yield of the fisheries. These biological observations should supplement the findings regarding the influx of Atlantic water into the Northern North Sea determined from temperature and salinity readings and from the course of drift bottles. To a certain extent they should help to define the degree and extent of the Atlantic influx. The fluctuations in occurrence suggest annual variations in origin and quality of the Atlantic Stream and possibly also in degree of abundance of the species in the area or areas of origin.

Sweden.

In response to the request for observations during the winter months in the eastern sector of the North Sea, Dr. K. A. Andersson was good enough to arrange for the Swedish research vessel "Skagerak" to carry out in December a search for herring larvae of autumn origin in the region between the Great Fisher Bank, Dogger Bank and the Skagerak. The operations were greatly curtailed by adverse weather conditions. The vessel proceeded to Kristiansund on December 3rd to wait for suitable working conditions. A start was made on December 9th for the Great Fisher Bank and a line of five stations was worked from there to the Skagerak. Operations, however, were suspended on the third day by a renewal of stormy conditions. The net in use was a 2-metre closing ring trawl and three hauls of twenty minutes' duration at the surface, and at depths of 20 and 40 metres were made at each station as shown in the following table.

Date	Time	Locality	Depth of Fishing	No. and Size of Herring Larvae	No. and Size of other Fish Larvae
9-12-36	10·18	56°58′ N.	0 metres	..	1 *Anguilla vulgaris*, 70 mm.
	to	4°35′ E.	20 —	..	—
	11·33 p.m.		40 —	..	1 *Crystallogobius linearis*, 31 mm.
10-12-36	1·30	57°02′ N.	0 metres	..	5 *A. vulgaris*, 68—76 mm.
	to	5°12′ E.	20 —	2 (20, 22 mm.)	1 *C. linearis*, 20 mm.
	2·45 a.m.		40 —	2 (19, 23 —)	—
10-12-36	4·50	57°06′ N.	0 metres	1 (21 mm.)	1 *A. vulgaris*, 74 mm.
	to	5°48′ E.	20 —	1 (20 —)	—
	6·8 a.m.		40 —	..	1 *C. linearis*, 15 mm.
10-12-36	8·10	57°10′ N.	0 metres	..	4 *Onos cimbrius*, 12, 18, 22, 30 mm.
	to	6°28′ E.	20 —	..	—
	9·46 a.m.		40 —	..	—
10-12-36	11·40 a.m.	57°14′ N.	0 metres	..	—
	to	7°00′ E.	20 —	..	1 *Trigla gurnardus*, 20 mm.
	12·48 p.m.		40 —	..	1 *Pleuronectes limanda*.

The results are meagre, but indicate, with other scattered data, the dispersal route of larvae from the Dogger Bank area. It is hoped that these difficult investigations will be continued during the critical winter period and ultimately lead to the solving of the problem of the inter-relationship of the herring stocks of the western and eastern sectors of the North Sea.

IV. FISHERIES

(a) Ichthyometrics.

England.

The ichthyometric work at sea was continued and included the measurements of 1,407 Plaice, 101,200 Haddock, 18,314 Cod, 103 Turbot, 2,773 Whiting and 271 Dabs. The haddock data were handed over to Scotland for analysis.

France.

Measurements were taken of samples of herring from French commercial vessels fishing round the Shetlands, on the west coast of Scotland and on the Fladen ground.

Germany.

Length measurements of herring were made on market landings and on samples taken at sea. The results have been utilised in the investigation on the composition of the herring shoals.

Holland.

Regular measurements of small plaice and haddock landed at Ymuiden were continued. This work has been extended to other species — Cod, Hake, Whiting, Sole, Turbot, Brill and Halibut.

Scotland.

Lobsters — Fishermen observers in the districts of Soay, Rousay and Burnmouth continued to measure samples of the catches of lobsters landed from the grounds in the vicinity during 1936. The figures supplied indicate very little change from the previous year in the size distribution of the samples and, consequently, if sampling has been representative, in the lobster populations of the three centres. The percentage numbers of lobsters of eleven inches and over to total sample in the three districts are Soay, 16·8, Rousay 61·1 and Burnmouth 37·1. The corresponding figures for 1935 were 16·8, 59·1 and 37·8.

Plaice — Regular weekly samples of market landings by seine net boats working in Aberdeen Bay were measured from June to November 1936.

The commercial catches as indicated in the following table were markedly steady during the period June to September after which there was an abrupt and rapid decline, at first with little or no decrease in catching effort. The conclusion drawn from the evidence outlined above is that the marketable sizes towards the end of the year had been fished out and that boats suspended or ceased operations in the bay because catches of remunerative sizes were no longer procurable.

Aberdeen Bay. Commercial Seine Net.

	Percentage Catches of various Categories			Total Landings (Boxes)	Number of Arrivals	Average per Arrival (Boxes)
	Medium	Small	Ex. Small			
June	9	41	50	371	80	4·6
July.....	14	36	50	611	102	6·0
August	16	47	37	601	130	4·6
September	21	45	34	814	198	4·1
October.....	26	38	36	400	160	2·4
November.....	48	32	20	96	93	1·0

(b) Fishing Technique.

Germany.

Experiments with the Echo Sounder were carried out on board a lugger. The Echo Sounder gave a good account of itself in assisting fishing operations, but the presence of shoals of fish in the Northern North Sea could not be established by this method. Experiments were carried out with a new Plankton apparatus.

Scotland.

A new magneto-striction Echo Sounding Machine has been fitted to the "Explorer" but so far positive results on the locating of fish shoals have not been obtained. A method of plankton collecting by the modern centrifugal pump was tried out with success in the estuary of the Forth during November and a report on the results of the experiment will appear in the "Journ. du Conseil", Vol. XII, No. 2. A preliminary notice appeared in "Nature", Vol. 139, p. 417.

V. FISH

(a) Herring.

France.

Observations were carried out on the herring fisheries of the Fladen and Inishtrahull grounds. A comparative study was made of the conditions of concentration of the herring in these areas with those of the Smalls, Nymph Bank and the Continental Plateau. Work was also carried out on the composition of the shoals, their scale age determinations and the mean number of vertebrae of the herring constituting these concentrations.

Germany.

The studies on the composition of the herring shoals of the Northern North Sea were continued.

Norway.

During February and March investigations were carried out on the Norwegian west coast on the spawning of herring with a view to locating the spawning grounds.

Scotland.

Racial Investigations. The Scottish east coast herring populations during summer contain a component, which, although closely allied to the Scottish autumn spawners, has certain features distinguishing it from any of the Scottish spawning communities. This component begins to withdraw from the Scottish drift-net grounds in July, and its older constituents form the majority of the herring caught by trawl on the Fladen ground from July until about mid-September. No evidence has been found that the maturing herring caught at this time on the Fladen ground spawn in Scottish waters. The investigations in 1936 were extended in the hope of obtaining information concerning the origin of these summer visitors to Scottish waters, and several samples of herring were obtained from the region of the Dogger Bank in September and October, from the grounds off Lowestoft in October and November, and from spawning shoals off Cape Gris Nez in December. These samples were obviously derived from different spawning stocks, but all of them showed features typical of the group referred to above, the most characteristic being a higher number of keeled scales (K_2) than is found in any of the Scottish spawning communities. The distinguishing characters of the main herring groups found in the Scottish area are analysed and discussed in paper (VIII, 7) "Race Investigation of the Herring Population of Scottish Waters".

Analysis of the Shoals. During June and the greater part of July of last year, the most important age groups consisted of fish in their fourth and fifth years, the younger group being the more numerous. At the spawning season the 1928 year-class came into prominence for the fifth year in succession and formed between 30 and 40 % of the spawning population. There has been no evidence in recent years of the emergence of a brood equal in strength to that of the autumn of 1928, which made its first big contribution to the drifter catches in 1932. The contribution by the 1932 year-class to the spawning shoals in 1936 did not come up to expectations. On the other hand, although none of the autumn hatched broods since 1928 has been large, recruitment of the stock has been fairly steady and, as a fair contribution is expected from the 1933 year-class, the prospects for the east coast summer fishery are reasonably good.

Fladen Trawl Fishery. The trawl fishery for herring on the Fladen ground during 1936 was on

e whole successful. This fishery, like the drift-net hery, has two distinct phases. In July, August and ptember the majority of the fish have well developed lts and roes, and are normally classed as "Full" "Filling" herring. After September the catches nsist of autumn spents, which have come offshore m the spawning grounds, and spring spawners th relatively small milts and roes. In 1936 the portion of spents during the latter part of the ason was much higher than during the last few ars, and the quality of the catches accordingly was low normal. The trawl catches contain higher prortions of the older year-classes than the catches m the drift-net grounds. This is due to the limited ward range of the younger groups, which appear be less able than the older herring to adapt themves to the deep water of the Fladen ground. Hence great intensification of trawling in this area since war must necessarily accelerate the depletion the stock of the older and larger herring.

Forth and Clyde Spring Herring. Investigans of the Forth and Clyde spring-spawning herring re continued. The good prospects forecasted for e Forth spring fishery were fully realised. Fivear-old herring (year-class spring 1931) were again minent in the Forth spawning shoals but those re outnumbered by a brood of 3-year-old herring ear-class 1933) which came on to the grounds to awn for the first time. The abundance of this brood a good augury for the Forth spring fishery for the xt year or two. The Forth fishery is, however, rely productive before the first or second weeks February, when the shoals, ripe and ready to awn, begin to come in from the open sea. Many rermen make the mistake of commencing fishing erations too soon, with the result that expense is en incurred without adequate returns.

As was anticipated, the Clyde catches throughout e summer and autumn of 1936 were poor. The awning shoals, which concentrated on Ballantrae nk and along the south coast of Arran in February d March 1936, consisted almost exclusively of and 5-year-old fish (year-classes 1933 and 1931 pectively). The younger group was derived mainly m the estuarine population, whereas the older oup came on to the spawning grounds from the en sea. The 1928 year-class, the outstanding brood recent years in the Clyde population, appears to ve been largely fished out or to have adopted an anic habitat, for its contribution to the spawning bals was almost negligible. As normally happens, majority of the adult fish left estuarine waters er spawning and thereafter the fishery had to rely the remnants of the 1933 brood which had not tured. Recruitment of the stock by the 1934 brood s poor and as a consequence the summer and tumn fishery was not productive. Practically all 1933 brood and a large proportion of the 1934 od may be expected to spawn in the spring of 37 and thereafter the fishery will have to depend gely on the immature remnants of the 1934 brood and on the younger 1935 brood. Although this latter brood appears to be fairly numerous, the prospects for 1937 are not encouraging either with regard to quantity or quality, unless the estuarine stock is supplemented by migrant shoals of large herring, which sometimes come from the open sea to the estuary in search of food.

An interesting feature in the material obtained from the Clyde was a group of small herring which showed the race characters of autumn spawners, and which probably were derived from or were closely allied to the Manx autumn spawning stock.

Minch Herring. Several samples from Minch waters were analysed. These confirmed the existence of a small community of autumn spawners peculiar to this region, distinguishable from east coast autumn spawners by having a lower number of keeled scales (K_2). This small community was recruited during 1936 mainly by 4-year-old herring (year-class 1932). Large shoals of herring entered Stornoway harbour in December. Examination of samples showed that two very distinct groups were present in these shoals, viz. spent autumn spawners, the majority belonging to the year-class 1932 and immature spring spawners of the year-class 1935. The contribution to the Minch stock by the 1932 autumn brood does not appear to have been large, but the addition of the 1935 spring brood, which may be expected to come into greater prominence in 1937 and 1938, should help towards replenishment of a depleted stock.

Location of Spawning Grounds. The information supplied by the skippers of trawlers landing at Aberdeen and Granton as to the occurrence of "spawny" haddocks was again of great value. The returns were not so frequent or so comprehensive as usual, but in association with other observations, as for example, of the distribution of herring spawning shoals and of the occurrence of the smallest sizes of herring larvae, useful additions have been made to the voluminous data on the spawning places of herring in Scottish waters. In spring, during the second half of March and the first half of April, the records of "spawny" haddocks were obtained almost exclusively from the grounds to the north-west of the Shetlands, in depths ranging from 60 to 80 fathoms, within a sector roughly west to north-north-west from Ronas Voe at 10 to 30 miles distant from the Shetland coast, the majority of the captures being obtained between 10 and 20 miles. This area is a prolific and regular herring spawning ground, but slight variations may occur in the time of maximum appearance of "spawny" haddocks which, however, may not be due entirely to differences in deposition of the herring eggs but may be conditioned by an early or late exploitation of the area by haddock and/or by the commercial fishing fleet. On the whole, the captures during the year in this area appeared to be slightly later than usual. Haddocks caught by line at the entrance to Loch Ewe during the first week in March were observed by the Fishery Officer,

Ullapool, to be full of herring spawn and samples of the stomachs were sent to the Laboratory for confirmation.

The autumn captures of "spawny" haddocks were obtained during the second half of August and throughout September at the following localities:—

Locality	Depth	Date
4/10 miles off Buchanness, within a sector ENE. to SE.	27-40 fm.	Sept. 6-18th
Aberdeen Bank	30-45 -	Sept. 18-19th
4/7 miles NE. from Longstone	31-48 -	Aug. 17-19th Sept. 12-13th
Berwick Bank	25-35 -	Aug. 18-19th
5 miles NE. Muckle Flugga	52 -	Sept 18-20th

The appearance of autumn spawners in the region of Muckle Flugga is an exceptional occurrence although it has been observed in other years. The other areas are regular spawning grounds though spawning may have begun earlier than usual on Berwick Bank and in the vicinity of the Longstone. In conjunction with the results of drift-bottle experiments, the above data have given useful starting points for the tracing of the dispersal route of the pelagic herring larvae.

Sweden.

Trawling operations for herring were carried out by the research vessel "Skagerak" during August on the Fladen grounds and in the Gut. The material collected has been utilised for a comparative morphological study between the herring of these areas and those of the Skagerak.

(b) Haddock.

Scotland.

The position of the haddock stock at the close of 1935 was that the good brood of 1931, except as mentioned below, together with all older fish, was practically fished out. It had made by far the greatest part of its contribution to the fishery. The brood of 1932 was of inferior numerical strength, 1933 was intermediate, and 1934 was also of inferior order. As a result of the succession of these three years of poor to moderate recruitment, there took place, as predicted, a decided decline in the landings of North Sea haddock at British ports from the end of 1935 onwards. This decrease was centred in the catches of small and extra small fish, the stocks of which had been so poorly replenished.

Scientific work and commercial catches in 1936 both showed, however, that the oldest year-classes, that is in particular the survivors of the prolific broods of 1928 and 1931, still persisted in the north and north-west of the region. On the cruise of the "Explorer" to the west coast of Scotland in June—July, for example, haddock of the 1931 and older broods together formed as much as about 33 % of the total catches made to the west of the Outer Hebrides. The fact that with increasing age the North Sea haddock broods normally tend to segregate more and more to the north and west is thus clearly illustrated.

The better hauls of the poor 1932 year-class was likewise made in northern waters. In its earlier years, too, it appeared to be best represented there. The year-classes 1932, 1933 and 1934 were so poor in numbers throughout the area in general, that over the year as a whole they averaged between them less than five per cent. of the total haddock captured. Fish in the third, fourth and fifth year normally support the bulk of the fishing operations of commercial trawlers. Previous investigations had indicated that the broods of 1933 and 1934 were perhaps best represented in the Middle North Sea. With their progressive depletion by trawling, their distributions in 1936 were more or less generally sparse.

It was stated in last year's report that there were strong indications during the latter half of the year that the brood of 1935 had experienced favourable survival conditions. It can now be said that this year-class has been found to be an exceedingly prolific one. It dominated the catches on every North Sea cruise of the "Explorer" in 1936, forming over 90 % of the total haddock catch almost everywhere. Even west of the Outer Hebrides just over 50 % of the haddock belonged to this year-class. It was in abundance on all the principal North Sea fishing grounds. It would appear to have been rather more irregular in its distribution in the southern reaches of the North Sea, but it was well represented in the Firth of Forth, which is unusual in any but exceptionally strong years. The Moray Firth, from the spring of 1936 onwards became heavily populated with the brood in question. Little or no spawning of haddock takes place within the Moray Firth, which depends for its stock upon recruitment by influx from waters outside the Firth. Such influx takes place on the average when a brood is about two years old so that the influx of 1935 fish was rather earlier than usual. The Moray Firth at present contains the largest population of haddock it has had for some considerable time, and the immediate prospects of the line and seine-net boats appears to be particularly bright. All over, the 1935 group is certainly the strongest since that of 1931 and, it would seem, even since that of 1928.

Although the 1935 year-class is so numerous and widely distributed its rate of growth has been in no way below normal. In the central North Sea, which is normally a slow growing area, its average size in October was 22 to 24 cm., approximately $8\frac{3}{4}$ to $9\frac{1}{2}$ inches. To the north and west of the Shetlands a region of relatively fast growth rate, the brood had reached an average size of 23 to 26 cm. by August. In the Moray Firth in November, of a total catch of 1,402 haddock taken in five hours' trawling, only twenty were less than $9\frac{1}{2}$ inches, the minimum landing size of the species.

The brood which was born in the spring of 193

an to occur in the catches of the "Explorer" in
e and July, and a few were taken to the north
west of Scotland during these months. In August
otal of about two hundred and fifty occurred in
nty-eight hours' trawling in the north-western
th Sea. About the same number was caught in
y-one hours' trawling between the Moray Firth,
central North Sea and the Firth of Forth in Sep-
ber and October. Only fifty-three were taken in
y hauls ranging from the Firth of Forth to the
kneys in November and December. At the same
, the 1935 brood was being encountered in large
nbers everywhere, so that the 1936 year-class is
idedly less numerous than was its predecessor.
actly how unsuccessful it has been, or whether
re are any areas of special concentration, it is as
too early to say.

Accordingly, throughout 1937, the decline which
k place during 1936 in the landings of small and
ra small haddock from the North Sea, due to the
cession of three years of poorer recruitment
32—33—34, will become noticeable in the larger
de categories. Although, in 1936, there were still
od hauls of 1931 and 1928 fish to the north and
st, these are bound to disappear from the stock
ogether in the near future. The highly successful
od of 1935 will, however, effect a noticeable improve-
nt in the smaller categories, and improvement in
ne will also be felt in the larger sizes.

Throughout the past year considerable work was
so done upon the stock fluctuations of the haddock
roughout the north-east Atlantic and a report on
is work has been issued by the Fishery Board for
otland (VIII, 5).

(c) Plaice.

ngland.

Transplantation Experiment. The "George
ligh" carried out a marking experiment on which
o hundred and sixty-four fish were taken from the
aisborough area and transferred to the Forth. One
ndred and sixty-four survivors were marked and
leased. One hundred fish were then taken from the
rth of Forth and transferred to the Haisborough
rounds. Eighty-five survivors were marked and
leased.

Twelve of the fish released in the Forth area and
ree in the Haisborough area have so far been
covered.

cotland.

Survey of Inshore Waters.

As mentioned previously, the programme of plaice
vestigations as regards localities surveyed, number
observations, and depth of water in which opera-
ons could be conducted, was curtailed during 1936.
n the east coast, the more important Moray Firth
calities — Dornoch Firth and Burghead Bay — and
so several selected Firth of Forth stations were
sited at various times throughout the year, while
September/October as full a survey as possible
was carried out of all east-coast plaice grounds from the Moray Firth to the Firth of Forth.

Moray Firth. All the localities within the territorial limits sampled by the research vessel were well stocked with small plaice. The good recruitment from the three previous years in Dornoch Firth and Burghead Bay was confirmed by the abundance of small plaice in these localities during 1936. The population consisted mostly of two- and three-year-old fish, the largest of which were still under the minimum landing size for plaice. A similar composition was observed on the Riff Bank grounds. Larger and older fish of the smaller marketable sizes, though never numerous, are generally taken at the outer Moray Firth localities as represented by Aberdour Bay, but the hauls in this region showed an abundance of baby fish just over one year old. Larger marketable sizes approaching the maturity stage were taken only in the Dornoch Firth and Burghead Bay, but their numbers were infinitesimal. The sizes of plaice within the territorial limits of the Moray Firth ranged from 10 to 36 cm. (10 inches) in length.

East Scottish Coast: Aberdeen Bay to St. Andrews Bay. Similar conditions as to size and age prevailed on this section of the coast. With the exception of Lunan Bay the catches were greatly inferior to those in the Moray Firth. Immature fish under 8 inches in length and representing the youngest age-groups predominated in the catches. Plaice of the smallest marketable sizes and just over three years old were far from abundant in any of the bays, while still older plaice were almost negligible everywhere.

No representatives of the brood produced during the year (1936) were taken anywhere on this sector of the coast. Generally speaking, indications of new accessions to the stock are obtained from St. Andrews Bay area even by the large research vessel so that the negative results in this region would seem to suggest unfavourable conditions for recruitment during 1936, at least so far as this important nursery area is concerned.

Aberdeen Bay. Aberdeen Bay is a permissible area for seine-netting with boats under 40 feet keel. From June onwards special statistics of the plaice caught by seine-net and landed at Aberdeen were collected and samples of the catches were measured each week. The market categories were "medium", "small" and "extra small", the mean sizes of which were 30·5, 26·5 and 24·4 cm. respectively. From comparison with the size and age composition of the plaice caught by the research vessel over the same period, the age composition of the commercial catches worked out as follows. During June and July the catches chiefly consisted of two- and three-year-old fish with a very few one and two years older. In August and September the composition was much the same except for the addition of a few of the fastest growing one-year-old fish. During October and November the latter came more into prominence and along with the two-year-old fish formed the bulk of

the catches. Except for the few fish now just over four and a half years old all were immature so that migratory movement to spawn was not a factor of importance.

Firth of Forth. The stock in this area differed very materially from the Moray Firth and other east coast bays, partly due to the fact that the stations worked were, on the whole, in deeper water than elsewhere along the coast but principally because the greater part of the observations were from areas not open to seine-netting. Size range was considerably higher, from 15 to 60 cm., as against 10 to 36 cm. elsewhere, and by far the greatest proportion of the fish exceeded 25 cm. in length. A succession of good year broods has contributed towards raising the density of the population to a more favourable level than for some years.

West Coast of Scotland. The only observation outwith the east coast area worthy of special reference, at least from a biological aspect, is one made during a survey of west coast grounds in July, at a position close inshore off the island of St. Kilda. Here a number of one- and two-year-old plaice was captured in the trawl showing that favourable conditions for deposition and survival of fry are possible even on isolated and exposed shores.

Marking Experiments.

Three plaice marking experiments were carried out during the year:—

(1) Moonen Bay in July.
(2) Firth of Forth in September. These fish were transplanted from St. Andrews Bay.
(3) Thurso Bay in November.

At the end of the year, the returns were 1, 33 and none respectively. The single recapture, a female 37 cm. in length, from Experiment (1), was found to have migrated coastwise round the north-west of Skye into Raasay Sound, a distance approximately of 40 miles. Of the thirty-five recoveries from Experiment (2), all immature fish and mostly of small size, twenty-nine were returned from positions in the vicinity of their original habitat, outside the Firth of Forth, about 15 to 20 miles along the coast. The other four were taken in the neighbourhood of the position to which they had been transferred. The periods of freedom ranged from 8 to 82 days, the majority having been at liberty under 25 days.

(d) Lemon Soles.

A study of the biology of the lemon soles has been continued. Age assessment of the population has been accomplished by scale reading of numerous representative samples and progress has been made towards a census of the several year-classes which make up the total population. The catches by the research vessel during 1936 approximately for the same unit of effort and from the same areas round the Scottish coast were higher than they have been for several years. They consisted of fourteen different year-classes. Fish born in the four successive years 1930 to 1933 formed the bulk of the captures. Two of these year-classes, viz., 1930 and 1933, were slightly more prominent in the catches. Lemon soles seem to escape capture by ordinary trawling methods during the first two years of life and few captures are made even at three years of age so that unlike the haddock and plaice, where brood recruitment can be assessed during the first two years of life, the strength of recruitment to the lemon sole stock cannot be estimated until the fish are at least four years old. Detailed investigation is being made of the growth rates in the different areas of distribution. So far, the best growth has been found in the East Scottish Bight from the Forth eastwards to the prime meridian and northwards to latitude 57° N. The Moray Firth and Fair Isle regions indicate an intermediate growth rate, while at the Shetlands growth is definitely poor. On the north-west and west coasts, and especially north-west of Ronas Voe and round outlying islands, e. g. North Rona, growth appears to be slow, but good growth areas have been observed in the Minch, and in the outer reaches of the Firth of Clyde and in Luce Bay. As in the haddock investigations, a general survey is being made of the food and feeding habits of lemon sole to correlate with these areas of distinctive growth rate. Many points in the early life history of the species are still far from well known, but efforts are being made to bridge the gaps in our knowledge of this critical period, for example, the spawning places, dispersal of the larvae, the localities where the fry settle down to a bottom habitat and the distribution of the adolescent stages.

(e) Megrim.

France.

The biological study of the megrim was continued on the same lines as in recent years.

(f) Mackerel.

France.

Observations were again undertaken on the concentration of mackerel on the Fladen and Utsire regions.

VI. SHELLFISH

(a) Lobsters.

Scotland.

At the beginning of the year thirty-five lobsters, twenty males and fifteen females, were under observation at the Board's Bay of Nigg establishment. During the year five males and three females died, while eight lobsters, all below $6\frac{1}{2}$ inches in length, were added to the stock. Of the males which died, one had been under continuous observation since 1931 and one since 1932. During that period the latter, $13\frac{3}{4}$ inches in length, did not moult at all. Only two males and three females of the original 1931 stock now remain. During the year ten males and

females cast their shells, one small male of $3^1/_4$ es received in 1935 casting twice — in July and n in September. The records of casting now total

n order to obtain reliable information regarding growth rates of lobsters, two things, apart from lar and suitable feeding, are necessary. First, ditions in the aquarium or lobster boxes must mble those in the sea as closely as possible and nd, a sufficient number of lobsters of both sexes of all sizes must be under observation. Circulation water conditions generally cannot be claimed to e been completely satisfactory at the Bay of Nigg dings and difficulty has been experienced in ring a sufficient supply of lobsters under six es in length. Nevertheless, these observations ie continuously since 1931 give an indication of course of events as regards growth of the lobster he sea.

he observations indicate that lobsters after the lt structural characters and the bottom habitat e been completely assumed, may be divided for present into five groups or growth periods. These :—

First bottom stage to a size of about 3 inches.
Lobsters measuring about 3 inches to about 6 inches.
Lobsters from about 6 inches to between 9 and 10 inches.
Nine to 10-inch lobsters to about 13 inches.
Lobsters above 13 inches.

Regarding Stage 1 no specimens of this size have far become available. The results of work carried at Port Erin, however, indicate that "moulting" urs three to five times but principally three times. ge 2 lobsters, as far as the present observations go, ariably cast twice per annum. In Stage 3 casting an annual event, while in Stage 4 casting is not re frequent than once in two years and in some es an even longer interval between moulting urs. It has been suggested previously (Report for 35) that the attainment of Stage 4 is probably ncident with the onset of first maturity. Sufficient terial to indicate the average frequency of casting ring the suggested Stage 5 has not been available t the actual increment at each cast, in the female least, appears to be exceedingly small.

The growth data so far indicate a quicker growth-e in the female in the earlier years. The average rements each year in Stages 2 and 3 and at each t in Stages 4 and 5 from the observed material as follows:—

ge		2	3	4	5
males	cm.	3·2	2·4	1·5	0·5
les	cm.	2·0	1·7	1·7	1·5

Thus, assuming for the time being that males reach ize of about 7·6 cm. (3 ins.) by the end of their ond year of life and females a size of about 9 cm. ($3^1/_2$ ins.) at the same period, male lobsters in east Scottish coastal waters under the conditions pertaining in the laboratory during the period of the observations, appear to take nine years to reach the size of 23 cm. (9 ins.), females reaching the same size in seven years.

Knowledge of the growth-rate and maturity of both sexes in the sea at different parts of the Scottish coast is highly desirable. It is obvious that even with considerably increased increment per year or per cast over that shown above, it would still be an uneconomic proposition either to rear lobsters to maturity or to impound undersized lobsters captured in the creels and to feed these until a marketable size is attained.

VII. BOTTOM FAUNA

France.

The study of the bottom fauna was continued during the cruise of the "Président Théodore Tissier" in the North Sea. Dredge hauls in the Gut were taken for geological examination of the sea floor in this region.

Scotland.

Evaluation of the Bays of the East Scottish Coast. Quantitative estimations of the available food supply for immature plaice in the bays of the east Scottish coast were carried out by means of the Petersen Grab which "bites" out a known area of bottom soil and brings it up with the living animal content. This instrument, however, has its limitations as it is not so effective on hard grounds, while many of the important food constituents, especially the more active Crustacea and fishes, escape capture. The results, therefore, show considerable variation from the stomach contents of plaice caught in the same bays. For example, Aberdeen Bay is an area of fast growth rate for plaice and yet the grab hauls indicate very poor feeding conditions, the explanation being that plaice there feed largely on sandeels, lugworm and polychaete worms which the grab does not capture.

In other areas, e. g. St. Andrews Bay, there may be considerable agreement at times when the fish are feeding on species taken by the grab. The problem is more complex than was anticipated and various methods are being employed so that representative collections of the animal populations can be obtained. The question of fluctuations in the abundance of the animal communities from year to year and season to season are also being considered to see what measure of correlation exists between these fluctuations and variations in the growth-rate of the fish. Chemical analyses of the more important food constituents will also have to be undertaken. The investigations in the shallow waters of the bays and estuaries frequented by young plaice were held up during the year through the small motor research vessel being out of commission.

VIII. List of Scottish Papers published (or in the Press) during the Year on Work within the Area.

The following papers relating to work carried out by present and former members of the Scottish Fishery Board's Scientific Staff were issued or prepared during the year:—

1. Lemon Soles (*Pleuronectes microcephalus*). Marking Experiments in Scottish Waters during the period 1919—1931. Alexander Bowman, with the assistance of Bennet B. Rae. (Fisheries, Scotland, Sci. Invest., 1935, No. 1). Issued in 1936.
2. Age Composition of Haddock in European Waters. Robert S. Clark, with a section — The Age Composition of the Haddock Stocks of the Different Fishing Regions of the North-East Atlantic covering the Period 1916—1935. D. S. Raitt. (Rapp. et Proc.-Verb., Vol. 101, Part 3, 1936).
3. Salient Features of the Hydrography of the Northern North Sea and the Faroe-Shetland Channel. John B. Tait. (Journ. du Conseil, Vol. XI, No. 2, August 1936).
4. Stock Replenishment and Fishing Intensity in the Haddock of the North Sea. D. S. Raitt. (*Ibid*).
5. The Haddock Stocks of the North-East Atlantic, 1916—1935. D. S. Raitt. (Fisheries, Scotland, Sci. Invest., 1936, No. 1).
6. *Calanus finmarchicus* and other Copepods in Scottish Waters in 1933. S. G. Gibbons. (Fisheries, Scotland, Sci. Invest., 1936, No. 2).
7. Race Investigation of the Herring Population of Scottish Waters. Henry Wood. (Fisheries, Scotland, Sci. Invest., 1936, No. 3).
8. Early Development Stages of Copepoda, *Rhincalanus nasutus* and *Eucalanus elongatus*. S. G. Gibbons. (Ann. Mag. Nat. Hist., Ser. 10, Vol. 18, Sept. 1936).
9. The Surface Water Drift in the Northern and Middle North Sea and in the Faroe-Shetland Channel, Part II, Section 3. John B. Tait. (Fisheries, Scotland, Sci. Invest., 1934, No. 1).
10. Experiments with the Hardy Plankton Indicator in Scottish Waters, I. S. G. Gibbons and J. H. Fraser. (Journ. du Conseil, Vol. XII, No. 1, April 1937).
11. The Food and Feeding Habits of the Haddock (*Gadus aeglefinus*) in Scottish Waters. Alfred Ritchie. (Fisheries, Scotland, Sci. Invest., 1934, No. 2).

SOUTHERN NORTH SEA COMMITTEE

1936.

By

A. Bückmann.

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Scientific Papers concerning the Committee's Work published in 1936.

INTRODUCTION

The present report on international investigations in the Southern North Sea area shows a steady continuation along lines generally adopted.

The basis of all work is the recognition of such biological factors as may be determining the yield of the fishery. The most important of these items are: the broods of food fishes, the decrease in number with age (primarily through fishing), the growth, and the distribution of food fishes in the sea.

Conditions of broods, the value of single year-classes, are closely studied in our area in respect of all important food fishes, such as herring or sprat, haddock or cod as well as plaice or sole.

The growth conditions of plaice first of all demand special attention, fluctuations being a determining influence on the yield of the fishery.

The distribution, and especially that of young fish after their pelagic stage, is of great importance to the yield of the haddock fishery. Of still greater importance is the formation of shoals and the migrations of the herring and there are also the not yet fully investigated questions of connexions between biological groups such as bank herring and Downs herring for example. Investigations concerning these questions have been continued and extended through observations on morphological properties of the herring larvae.

The question of the influence of the fisheries on the food fish stocks becomes increasingly pressing and investigations are very momentous. Almost all results of such investigations agree: It is proved that the present fishery methods are not sufficiently rational; as far as cod is concerned the position in recent years has become less satisfactory, as to sole the results demand attention, and with regard to haddock and plaice the position is critical. Special anxiety is felt after the latest investigations of the egg-production of plaice the results of which confirm the supposed decrease in the size of mature stocks.

Recognition of such facts has, in recent years, forced various countries to introduce legal regulations in order to make the fishing industry utilize the stocks more rationally. Further investigations into the vitality of caught plaice will give a valuable basis for judging the effect of such regulations. It is to be hoped, however, that useful regulations may be generally introduced at an early date through international agreement. The goal of maritime research, however, is by no means thereby reached; not only are we far from the best possible utilization of the stock in actual practice, but even theoretically our views on the questions are not as yet sufficiently elucidated.

Although the investigation of food fishes forms the nucleus of our work, all other investigations here

reported are indispensable foundations of our knowledge of the life of the food fish. Plankton and bottom fauna are food-factors of importance to the growth of fish and, in some instances, to distribution also. The qualities and movements of water masses (occasionally better recognized through plankton-contents than by chemical or physical examinations) influence the distribution of fish food and brood, possibly also the survival of fry and thereby the quantity of young fish. Thus, our multifarious problems form an indivisible whole.

Investigations of plankton and hydrography in our area are included in this report where directly related to other reports only; to avoid repetition such questions are referred to the respective committee-reports.

The Belgian work in our area is fully recorded in the report of the Combined North Sea and Eastern Channel Committee and references only are repeated in this report.

Valuable assistance to our work has again been given by ship-owners, officers and crews of fishery patrol vessels, fishing-vessels and light-vessels. Our recognition and thanks are hereby recorded.

The following laboratories take part in the international investigations in the Southern North Sea:

Belgium:

Institut Maritime d'Ostende, Ostende-Phare.

Denmark:

Dansk Biologisk Station, Charlottenlund Slot.

Marinbiologisk Laboratorium, Charlottenlund Slot.

Skalling Laboratorium, Esbjerg.

England:

Fisheries Laboratory, Lowestoft.

Department of Oceanography, University College, Hull.

Dove Marine Laboratory, Cullercoats.

France:

Laboratoire de l'Office Scientifique et Technique des Pêches Maritimes (Station Aquicole), 17, Boulevard de Châtillon, Boulogne s. Mer.

Germany:

Staatliche Biologische Anstalt, Helgoland.

Arbeitsstelle für Fischereiforschung der Staatlichen Biologischen Anstalt Helgoland und des Instituts für Seefischerei in Wesermünde, Wesermünde-G., Handelshafen.

Fischereibiologische Abteilung des Hamburgischen Zoologischen Museums und Instituts, Hamburg 1, Kirchenallee 47.

Institut Senckenberg am Meer, Wilhelmshaven.

Holland:

Rijksinstituut voor biologisch Visscherij-Onderzoek, Afd. Zeevisscherij, s'Gravenhage, Bezuidenhoutsche Weg 58.

Rijksinstituut voor chemisch, microbiologisch en hydrographisch Visscherij-Onderzoek, Den Helder.

Kongl. Nederl. Meteorologisch Instituut, De Bilt.

Norway:

Fiskeridirektoratet, Avdeling for Havundersökelser, Bergen.

Scotland:

Fishery Board of Scotland, Marine Laboratory, Wood Street, Torry, Aberdeen.

Sweden:

Statens Havsfiskelaboratorium, Lysekil.

A. WORK AT SEA

Belgium.

Monthly cruises were carried out as formerly on the line Deal—Gravelines. On West Hinder Lightship plankton and hydrographical work was continued.

Denmark.

No research vessel was available for investigation in the open North Sea. In the Horns Reef Area the "Biologen" carried out the work previously made by the "Dana II" for the "Dansk Biologisk Station". A motor boat was used in inshore waters between Ho Bay and the southern end of Romø in the months of June, July, September and November.

Fishing experiments from the "Biologen" with the 50-feet otter trawl were carried out at 28 stations in the Horns Reef Area, between June 12th and 21st, especially for investigations into the stock of **plaice**; the further, fishing experiments with the "Eel-tog" were carried out at 7 stations in the Nissum Broads on May 23rd and 24th and on Sept. 18th to 19th at 7 stations.

England.

The "George Bligh" was in continuous commission throughout the year. Seventeen voyages in all were carried out. Five comprised trawling work including transplantation, vitality experiments and experiments on trawling gear. Four were for plaice eggs. Seven were for plankton and hydrography. One voyage to Iceland was undertaken in co-operation with the Danish scientists, in order to preserve continuity of the work in that area, in absence of a Danish research vessel.

The M./V. "Onaway" was also in full commission and carried out varied work in connection with herring shoals, plankton and hydrography.

The work on **fish eggs** and **larvae** was continued on the Varne, Galloper and Sandettié lightships, the latter through the co-operation of Prof. LE GALL. Current measurements with drift-indicators and vertical-logs took place on the above vessels, the Cromer Knoll and the Royal Sovereign. Surface drift bottles were released each week from the Smith's Knoll lightship. Surface samples on steamship routes have continued. The continuous work on lightships and steamships and the work of the English measurers on commercial vessels has been made possible by the courtesy of Trinity House and the owners, masters and officers of the vessels concerned.

France.

Regular observations were continued as before:

onboard the Sandettié L. V.: temperatures, water nples from surface and bottom; current measure- nts, and collection of plankton samples in col- boration with the Lowestoft Laboratory. On the ites (2) Dunkerque—Folkestone and (3) Boulogne— lkestone: Hydrographical observations, (surface mperature and salinity) in collaboration with the westoft Laboratory.

Cruises. (1) Cruises by the garde-pêche "Ailette" d "Quentin Roosevelt", of the "Station de la anche, de la Mer du Nord et d'Islande"; May— tober: regular observations on the herring and the ackerel fishery in the Southern North Sea; Novem- r—February: regular observations on the herring hery at the eastern entrance to the Channel and the Straits of Dover (temperature, water-samples d plankton samples). (2) Cruises by the "Président héodore Tissier", September 1936. Hydrologic servations: temperature, water samples and plank- n samples from the Southern North Sea and the nglish Channel; geologic dredging; studies of the b-marine Rhine-valley.

ermany.

From February 1st to 21st the "Poseidon" was mmissioned in the area between 53° and 55° N. Lat. d from the continental coast to the Doggerbank, e main objects of this voyage being the study of ood, plankton and hydrography, as well as bottom una and the distribution of the sole.

A second cruise took place between April 24th and ay 4th off the East-Frisian and Dutch coasts as r as the 40 m. contour and as far south as the Maas V.; prime object: study of the spawning of the le and in addition hereto plankton and bottom una.

Between September 30th and October 24th the hery patrol vessel "Weser" visited the herring grounds the Doggerbank, and between November 12th and ecember 14th the "Elbe" visited the Smith's Knoll d the Eastern Channel areas. Investigations of ood, plankton and hydrography were undertaken both cruises.

The M/V "Augusta" from the Biologische Anstalt as in continuous commission throughout the year the inner German Bight. During May/June the laice and the sole were investigated along 5 sections etween Norderney and List (Sylt) and similar vestigations were made around Heligoland in July nd September.

olland.

The "Nautilus" was engaged for some weeks in ring outside the North Sea and excepting a few awl-hauls analysed, she has not been working in he Southern North Sea.

cotland.

The Scottish research vessel "Explorer" entered he northern sector of the area in September and gain in October. Both cruises were of short duration, the latter being curtailed owing to adverse weather conditions. In September the area between the Dogger Bank and the southern end of the Gut was investigated. The line of stations extended from the Longstone to the Great Fisher Bank. This section formed part of a more extensive cruise to northern waters. During October the region between the Forth and the western end of the Dogger Bank received attention. At all stations on both cruises a comprehensive scheme of work was undertaken, hydrographical, planktonic and trawling observations being carried out concurrently. Surface drift bottles were liberated at all stations. The main object of the cruises was to extend the observations taken in the Northern North Sea on the prevailing hydrographical and planktonic conditions and to survey the stocks of haddock within the southern area.

B. FISH

I. General.

1. Statistics and Ichthyometrics.

England.

The collection of statistics and ichthyometrics has been continued and the number of the chief species measured are approximately as follows:

At Sea

Plaice	Haddock	Cod	Whiting	Dabs	Total
135	30,015	6,526	3,588	1,779	42,043

On the Markets

Plaice	Haddock	Cod	Herring	Total
56,165	5,085	37,866	76,290	175,406

The haddock data have been handed to Scotland for analysis.

France.

Measurements of various kinds of food fish have been continued according to previous programmes; species specially studied are: herring, mackerel, sardine, sprat and the sand-eel.

Germany.

Collection of data from fishing steamers concerning place and the duration of fishing has been continued by the "Arbeitsstelle für Fischereiforschung der Biologischen Anstalt Helgoland und des Instituts für Seefischerei in Wesermünde" at the Wesermünde—Bremerhaven, Altona—Hamburg and Cuxhaven markets. Monthly reports and a report for the whole year have been published.

Corresponding data have been collected from seagoing cutters at the Altona—Hamburg market.

Holland.

Fairly regular measurements of plaice and haddock have been made at the Ijmuiden market. With a

view to the introduction of size limits such measurements were extended as from January 1st, 1937, to other species: cod, hake, whiting, sole, brill, turbot and halibut. It is intended to carry out similar measurements at Scheveningen.

II. Cod and Haddock.

England.

Survey of the stocks and landings of cod from the North Sea has been continued by the observations of two measurers on the market at Grimsby and in combination with the statistics of quantity landed. It is now perfectly clear that, since 1933 fishing has been taking a larger proportion of the younger cod, as substitutes for the smoked haddock trade, and that this tendency seriously reduces the fishery for the more valuable large cod.

The decline in the fishery generally has been slightly mitigated as regards some of the very young fish, and, from the time and form of this improvement, it can very fairly be ascribed to the mesh regulations that are in force.

Germany.

The small material of haddock scales from the cruises of the "Poseidon" in the year under review was handed over to the Fishery Board Laboratory in Aberdeen.

A manuscript on investigations into the quantitative food of haddock and other gadids is in preparation and will soon be finished.

Holland.

As to market measurements of haddock, cod and other species, see B. I, 1.

Scotland.

Cod were plentiful in the trawl hauls off the Northumberland coast during October. The sizes ranged from 73 to 115 cm. The general feature of the haddock investigations will be found in the report of the Northern North Sea. The great majority (about 95 %) of the haddock in the catches belonged to the year-class 1935. The average size of this brood was about 25 cm. The new recruitment or year-class 1936 was relatively very poor. A few representatives were taken in the region of the Fisher Bank, but farther south the catches were infinitesimal. Older haddock, as to be expected, were very scarce, the only localities where more than 20 fish per unit haul were obtained being Berwick Bank and the Great Fisher Bank. Elsewhere they were almost negligible in the catches. Good hauls of 1935 haddock were obtained off the Northumberland coast in October, but the distribution of this brood was far from uniform over the area investigated.

III. Herring.

1. Survey of Stocks and Landings.

Belgium.

The investigations on the fishery and biology of the spent herring at the Belgian coast were continued.

England.

The detailed examination of the herring stocks has, in 1936, been confined to the East Anglian area. During the autumn season 3,100 herrings have been examined for age, weight, length and maturity in the laboratory, and 66,978 fish were measured on the markets at Lowestoft and Yarmouth. The weighing of fish of each age-group has made it possible to estimate the age composition of the herring shoals by actual numbers instead of the more usual percentages, and already this method which was started in 1935, is beginning to show great possibilities in the researches into the fluctuation of the stock.

A forecast was again published in August, 1936, giving an idea of the composition of the forthcoming autumn-fishery in East-Anglian waters, and it can now be said that this proved to be accurate. It has been found that there is a slight difference between the forecast proportion of four-year-old fish to seven-year-olds and the observed proportion, but this is easily explained. The fishery did not start until about the middle of October so that the young fish, which appear first on the grounds, were not fully represented in the final figures. Further, nearly 19,000 new nets of larger mesh have been issued to the fleet under a loan scheme, and these have had the effect of increasing the proportion of the older herrings in the catches. The main ages in the stock of these herrings were four and seven.

France.

The herring shoals of the Southern North Sea and the Eastern Channel have been investigated according to the programme previously prepared: the preliminary results obtained for the season 1936/37 are as follows: (see top of next page).

It should be noted that the herring of the Southern North Sea (group Dyck-Sandettié) were caught by trawl, while those from the Eastern Channel: Gr. I and II were caught by drift-net. In spite of the difference of the fishing gears there is no significant difference in the composition of the stock.

The 1932 year-class which has been remarkably strong in the spawning concentrations since 1935, proves in 1936, to be an excellent recruitment-class. The 1931 year-class is also well represented, while the 1930 year-class once more proves to be distinctly bad. The 1933 year-class appearing for the first time in the shoals in 1936 is expected to become inferior to the average in future shoals.

Germany.

The herring investigations carried out in the

Dimension.

gth in cm		20	21	22	23	24	25	26	27	28	29
up Sandettié-Dyck....	%	0·7	2·7	5·9	11·6	24·2	24·2	19·2	9·1	2·2	0·2
th Somme, Gr. 1.....	%	0·4	1·5	4·0	13·8	29·6	28·6	15·0	6·4	0·6	0·2
th Somme, Gr. II....	%	—	1·8	5·6	15·5	31·8	26·1	13·2	5·5	0·3	0·2

Age.

ter rings		2	3	4	5	6	7	8	9	9 and more
: year		3	4	5	6	7	8	9	10	10 and more
r-classes		1933	1932	1931	1930	1929	1928	1927	1926	previous to 1926
up Sandettié-Dyck....	%	6·5	40·9	20·2	8·0	16·2	3·2	3·0	0·8	0·8
th Somme, Gr. I	%	4·6	55·2	17·8	4·6	10·5	2·9	2·9	0·9	0·6
th Somme, Gr. II	%	8·7	45·8	28·2	2·2	10·6	2·2	1·1	1·1	0·2
an of the three groups.	%	6·6	47·3	22·1	4·9	12·5	2·8	2·3	0·9	0·5

thern North Sea by the "Fischereibiologische teilung", Hamburg, were confined to market lyses for determining the composition of the ch and to investigations as to the progress of the rman herring fishery. 16 samples totalling 3,200 rings were examined.

lland.

More detailed information regarding investigations o the age and race of the herring of the Flemish ght and the eastern Channel is given in the Administative Report of the Combined North Sea and stern Channel Committee.

2. Rate of Growth.

ance.

The growth of the herring investigated has also en examined. The results obtained will form the bject of a future publication.

3. Net Experiments.

ngland.

It has not been found necessary to continue net periments for the present, and as the measurement commercial meshes is carried out every two years is will not be done again until 1937.

4. Young Herring.

ngland.

Further work on the distribution of whitebait ring has been done on the Yorkshire coast and he Northumbrian coast during 1936. The measureents of these fish have been used to augment the formation contained in a diagram to be found on ge 41 of "Investigations into the Age, Length and aturity of the Herring of the Southern North Sea" ish. Invest. Ser. II, Vol. XI, No. 7, London 1929). It is clear that although several years have passed nce the diagram was prepared, the young herring easured during 1936 still conform to the growth originally deduced.

On the Northumberland coast a phenomenon of some considerable importance has been noticed. Briefly it may be stated that the distribution of whitebait herring on this coast seems to be closely related to water movements in the northern part of the North Sea, and according to the size of the herrings it will be possible to say something about the direction of currents along the Northumberland coast in the early months of the year. This work is being continued.

Germany.

The "Fischereibiologische Abteilung" in Hamburg has analyzed 8 samples totalling 3,000 young-herring from the estuary of the Elbe.

Extremely few one-year-old herring were caught in the German Bight during the investigations by the "Biologische Anstalt". On the other hand there were exceptionally large catches of larger forms of young-herring in the first days of 1936 by deep-sea cutters in the vicinity of Heligoland. Some investigations as to length, maturity, and stomach-content were made on this occasion. The fish were immature and about 17 cm. in length, mixed with single larger maturing spring herrings. All stomachs investigated were empty. A brief paper on this remarkable appearance of herring near Heligoland has been published (U. Schmidt).

5. Larval Herring.

England.

A catch of larval herring 20 mm. in length on the Northumberland coast in June, 1936, is worthy of note. These fish appeared at a time when the bulk of the postlarval herrings were 40—45 mm. in length, and it seems that they could only have come from the Firth of Forth spring spawning, since the presence of "full" fish in the immediate neighbourhood is unknown at this time. It certainly points to the fact that this "spring" spawning must be of longer duration than hitherto supposed.

The collections of herring larvae from the Varne, Galloper and Sandettié lightships have been and are being continued. The material is being tabulated, with a view to comparing the influx of larvae into the North Sea from year to year.

Germany.

Investigations of herring larvae were carried out during the cruises of "Poseidon" in February and April/May as well as during the cruises of the fishery patrol vessel in October and November/December, 1936. Herring larvae from the cruises of the "George Bligh" in December 1935 and January/February 1937 were sent from the Fisheries Laboratory, Lowestoft, to the "Biologische Anstalt" for examination.

The distribution, frequency and length of the 1935 autumn herring larvae, the appearance of which had already been investigated during the cruises from October to December 1935, were to be further examined during the February-cruise of the "Poseidon" in order to ascertain the transport and growth of the larvae. Satisfactory results were obtained. Larger larves, evidently originating from spawning on the western part of the Doggerbank, were found in February in the entire area between the Doggerbank and the German coast. Their length was increasing towards the east. Small larvae, evidently originating from the spawning area of the Downsherring, were caught in numbers between Haak's L. V. and Borkum Riff L. V., while minor quantities were present in the middle of the German Bight, northwards as far as List (Sylt) and eastwards to the estuary of the Elbe with the characteristic forms of Plankton from the Channel. The length of the larvae was increasing towards north-east, but a distinction from the Doggerbank-larvae, based on length, was noticeable almost everywhere. The catches from the "George Bligh" illustrate the simultaneous distribution of the Downs-herring larvae in the Flemish Bight.

The autumn fry of 1936 were investigated during the cruises October—December 1936. On the western edge of the Doggerbank the young larvae were found in October in the same area as in previous years. Apparently, one of the catches was made on a newly hatched shoal directly on the spawning ground. In one haul at 30 m. depth the larva-net contained, besides numerous empty egg-mantles and drifting eggs, some 25,000 larvae, all but a few having a large yolc-sac (about 18,000 to the square metre).

In November herring larvae were found in large numbers (about 600 per $m.^2$) in the Cleaverbank area; mean length 10·4 mm. Early in December, in the vicinity of the Noord-Hinder L. V., the larvae of the Downs-herring were much scarcer than in 1933—35, further south, however, in the Dungeness-Boulogne-Dyck-East Goodwin area, they occurred in far larger numbers. This distribution was to some degree similar to that of December, 1928.

The rearing experiments with fry of spring herring from the German Bight were continued, results, however, were not satisfactory. Interesting determinations were made of the period of incubation and of the resorption of the yolc-sac at various temperatures.

Scotland.

Larvae from 20—25 mm. in length were numerous in the Longstone area in October. Farther east and south the numbers at this size diminished. Large numbers of a smaller group, 10—15 mm. in length, occurred in the region of Brucey's Garden.

6. Herring Races.

France.

The mean vertebral number of herring taken south of the Somme (our Gr. II) was slightly inferior in 1936/37 to the ordinary mean (i. e., 56·63 instead of 56·70). This mean, however, was increasing by the end of the season. The above-mentioned decrease in the mean shows a strong penetration of herring of the group: Dyck-Sandettié (autumn-spawning North Sea herring with mean vertebral number of about 56·50) in the Eastern Channel. This opinion seems to be confirmed by the results of the counts in herrings belonging to the group Dyck-Sandettié and group I (north of the Somme). In these two groups the mean vertebral number was very close to 56·50 (56·44 Gr. Dyck, 56·51 Gr. I).

Germany.

Vertebral counts were made on 3000 herring larvae, caught during the winter and spring, 1930—34, within and off the estuary of the Elbe. The purpose was to examine whether the larvae originating from the spawning area of the Downs-herring — recognisable until the end of the winter on account of their smaller size — could be distinguished from the Doggerbank larvae by their vertebral number. The extent of the countings is as yet insufficient, and the results are not yet entirely clear. Generally it was established that the smaller larvae caught late in the year did not show a higher vertebral number than the larger ones caught earlier. If the material is compared from year to year, there is a considerable variation in the average value (56·38 in 1932—56·64 in 1934). These investigations will be continued.

Holland.

During the summer of 1936 opportunity was given for making analyses of waddensea herrings landed in April at the Helder. The 350 fish had a length of 19—24 cm. and were mostly in stage III. They were almost all 3 or 4 years old, and their average number of vertebrae was 55·22 and 55·20. — There can accordingly be no doubt that they belong to the type of the former Zuiderzee herring, but what is striking is the fact that the now 3-year-old fish (year-class 1933), even after the closure of the Zuiderzee in May, 1932, have the same average number of vertebrae as the older year-classes. In 1933, still many herring larvae were observed in the closed area, and the next years will show whether the much debated question regarding the dependency of race characters (heredity or environments) can be plainly answered here.

sample of 106 young herrings with an average
th of 100·99 mm., caught in the beginning of
outside the dike, belonged to the bank herring
rage number of vertebrae: 56·36).
urthermore investigations were carried out as to
race characters of 6000 herring larvae caught in
Haringvliet and the Oosterschelde. A scientific
on these investigations is given in part III,
pendix 3.

tland.

few herrings appeared in the trawl catches of
"Explorer" from the region of North East Bank
Brucey's Garden. These were mostly maturing
at stages IV to V. A commercial sample from
area caught about the same time and landed at
rdeen was secured for morphological examination.
e analysis was made of three samples of herring
n the Dogger region in September and October,
samples from Lowestoft waters in October and
vember and one sample from the spawning shoals
Cap Griz Nez in December. No appreciable dif-
nce was observed in the number of vertebrae of
ttish and Dogger Bank autumn spawners, but
nificant differences were observed in the number
keeled scales (K_2). The K_2 of Scottish autumn
wners never exceed 14·9 on the average, while the
ans of the Dogger samples ranged from 15·0 to
3. The Lowestoft and Cap Griz Nez herring showed
ight increase in the number of vertebrae, associated
h a slight decrease in the number of K_2, the means
which ranged from 14·9 to 15·1, i. e., higher than
the Scottish autumn spawners. In short, the
wners of the middle and southern North Sea show
tures characteristic of a group of herring found on
drift-net grounds off the Scottish east and north
st coasts in June and July and on Fladen Ground
m July to September. The details of the above
ches are given in a report published by the Fishery
ard of Scotland.

IV. Plaice.

1. Survey of Stocks and Landings.

nmark.

During the fishing experiments from the "Biologen"
June the year-class 1928 had practically disap-
ared. The poor year-classes 1929—1932 (age-
ups VII—IV) formed 2·7 % only of the stock
tween the 5 and 30 m. lines. The number caught
r unit time of these age-groups was a fourth only
compared to the number of the same age-groups
ught in 1935.

The number of the year-class 1933 caught per unit
ne was 25 % higher than the number of the year-
ss 1932 caught in 1935 and less than the number
the poor year-class 1931 in 1934. In 1935 the
ength of the year-class 1933 (as II-group) was
dged to be about normal. Undoubtedly the great decrease in number is due to the intensive trawl fishery on the grounds.

As a consequence of this deficiency of all the year-classes from which commercial fish for the live-plaice fishery are to be recruited in the coming year, the outlook for this fishery is still very bad, and so much more as also the stock of plaice above the Danish size limit has been strongly diminished.

Similar to 1934—1935 the number of plaice over 25 cm. in length, decreased to about one third of that of the previous year, and the number of plaice of 20—24 cm. length to about one fourth! The decrease of the number of plaice of 15 to 19 cm. (mainly recruiting the fishery during 1937) has decreased by 15 % only.

The number of the younger year-classes caught seems to have been rather satisfying. The number of the II-group (year-class 1934) was 10 % above that of the same group in 1935 and the number of the I-group (year-class 1935) was 30 % above that of 1934. The year-classes 1934 and 1935 must be considered to be about normal, but remembering how the year-class 1933 was decimated under the present intensive trawl fishery, it cannot be expected that they will become of very much value to the Danish fishery.

On the occasion of the transplantation of plaice from the North Sea to the Belt Sea and the Sound otoliths were examined from 1950 plaice caught during April and the first half of May by the Danish seine off Skallingen and in Slugen. The lengths of these plaice were about 17—25 cm. and the percentages of the age-groups in the plaice transplanted were as follow:—

Age-group	II	III	IV	V
Year-class	1934	1933	1932	1931
Percentage	6	60	21	7

Age-group	VI	VII	VIII
Year-class	1930	1929	1928
Percentage	2	2	1

The relative number of age-groups V—VII has declined very much, compared with the number in 1935.

A still higher percentage of the younger age-groups was found from an investigation of 563 plaice of similar lengths caught off Thyborøn on the occasion of the transplantation to the Limfjord, 20 % and 71 % respectively for the II and III-groups.

In the Nissum Broads the fishing experiments with the "Eel-tog" during May and September gave the following average number of plaice per 30 minutes' haul:—

Age-group	0	I	II	III
May 1936	—	152	121	18
Sept. 1936	55	222	81	4

The year-class 1935 shows the same number of plaice per time unit as did the year-class 1933 in 1934 and considerably more than the year-class 1934 in the fishing experiments of 1935.

Collection of material of 0-group plaice in the coastal waters was carried out in the waddensea area from the Ho Bay to Sylt in four periods from June to November; in June and November work was carried out in the Ho Bay and at Fanø only, in July and September also farther south viz. to the southern end of Romø.

A total of 73 hauls were taken, 7 in June, 26 in July, 32 in September and 8 in November. JOHANSEN's young-fish trawl was used; the same implement as used in the years 1932—34 and partly 1935 was employed (ground rope 10 m.). 15 minutes' hauls were carried out.

The following numbers of 0-group plaice calculated per one-hour hauls were obtained; for comparison the numbers from previous years are included in the table below:—

	1932	1933	1934	1935	
	Primo May	Medio July	Sec. June	Medio June	Primo Sept.
Average No. per haul	0	53	42	207	(120)[1]
No. of hauls	14	13	11	6	(33)[1]

	1936			
	Medio June	Sec. July	Primo Sept.	Sec. Nov.
Average No. per haul	136	141	301	117
No. of hauls	7	26	32	8

[1]) A smaller implement used.

The highest numbers per hour have been obtained in the period of low water and especially of rising water (up to 2,407 per hour). The quantity of the 0-group in 1936 is comparatively high as far as can be seen from the experiments carried out in the area. During the year, however, some other methods to calculate the quantity of 0-group plaice in the waddensea has been commenced in co-operation with the Skalling Laboratorium, as the young-fish-trawl method cannot procure fully reliable results in this special area.

Measurements of the different trade categories at Esbjerg have been continued 6 times during March—November, a total of about 19,000 specimens having been measured. The shifting of the fishing grounds for live plaice towards deeper water has continued since 1935. The size composition of the landings from Dogger Bank, and especially at the SE. edge of the Dogger has increased rather much, in the last-named area about 5 cm.

Together with the collection of special market statistics the measurements enable the calculation of the total number of plaice of different lengths caught from Esbjerg. During Jan.—Sept. 1936 about 5 % only of the plaice landed alive were below 260 mm. length, some 50 % between 260 and 280 mm.

England.

The routine collection of otoliths of each trade category of plaice was continued at Lowestoft and Grimsby. The number of fish which were weighed, measured and otolithed are shown in Table I.

The 1936 material has been worked up with the exception of the December samples from Grimsby, and the percentage numbers of each age-group shown in Table II, may be compared with those for 1931 to 1935 given in the previous reports[1]).

The 1932 year-class has been the most abundant in the landings of both ports during 1936. A comparison with the landings per 100 hours' fishing of other year-classes, when in the IV-group, shows that 1932 was approximately as numerous as the year-class 1928 in the Grimsby landings. In the area fished from Lowestoft, however, it appears to be considerably less abundant than the 1928 year-class, but on the whole can be described as a "good" year-class.

The 1933 year-class appears to be poor in the Lowestoft landings, as far as it is possible to make adequate comparisons; these are somewhat hampered by the enforcement of the size limit of 23 cm. in August, 1933, which curtailed the landings of the III-group. In the Grimsby area it may be described as moderately good. The 1928 year-class in the VIII-group is more abundant than any previous year-class examined at Lowestoft throughout the whole period of investigations which began in December, 1927.

Germany.

The M./S. "Augusta" worked, in May/June 1936, five sections between Norderney and List on Sylt in order to make a survey of the plaice population in the German Bight, and in July and September the stations in the vicinity of Heligoland were worked. On the whole 15,000 age determinations were carried out.

As in the preceding year the majority of the population were the age-groups I—III (in May/June about 90 %). The 1935 year-class (I-group) was well represented with a few exceptions, but a prediction is not yet possible. The 1934 year-class (II-group) was proportionally as well represented as year-class 1933 in the preceding year. In September 1936 the II-group was more frequent at Heligoland than the III-group. Hence the 1934 year-class is at least as strong as the 1933 year-class, i. e. of medium strength. The 1933 year-class (III-group) proved generally stronger than the poor 1932 year-class at the same age. This year-class, now four years old, formed mostly 3—7 % only of the catches. In May only near Otzumer Balje and in July near Heligoland it was of any importance. The older year-classes (1931—1929) and the rich 1928 year-class were now caught in very small numbers only.

[1]) See Rapp. et Proc.-Verb. LXXXV, 2e ptie., p. 44, 1933; LXXXIX, 2e ptie., p. 44, 1934; XCIV, 2e ptie., pp. 36—37, 1935; and 100, 2e ptie., pp. 60—61, 1936.

le I.

Number of Plaice measured, weighed and otolithed.

Lowestoft

1936	Dead Small	Small	Best Small	Small Medium	Best Medium	Slabs, Large and Best	Total
l	451	271	269	68	67	38	1,164
	491	261	369	36	50	84	1,291
ber	409	233	330	28	25	70	1,095
mber	407	218	366	76	69	52	1,188
	1,758	983	1,334	208	211	244	4,738

Grimsby.

1936	Chats	Small	Big Small	Middles	Best Medium	Large Best	Large	Total
ch	450	445	304	233	193	134	91	1,850
	558	495	431	315	176	109	95	2,179
ember	468	491	454	311	136	130	84	2,074
mber	419	506	418	256	172	126	74	1,971
	1,895	1,937	1,607	1,115	677	499	344	8,074

ble II.

centage Number of Plaice landed in each Age-Group at Lowestoft and Grimsby in certain Months of 1935—1936.

Port	Date		Age-Group II	III	IV	V	VI	VII	VIII	IX	X	XI+
		Year of Birth	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924—
msby	Dec. 1935	Percentage	2·5	19·4	14·7	24·0	9·7	19·6	3·2	1·6	1·5	3·9
msby	Mar. 1936	—	4·6	33·8	20·2	16·6	7·8	11·9	1·9	0·9	0·7	1·5
		Year of Birth	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925—
vestoft ...	April 1936	Percentage	0·2	6·9	36·0	19·5	18·0	10·1	8·5	0·2	0·2	0·4
msby	June 1936	—	0·5	13·7	49·0	15·8	9·5	3·5	5·7	0·6	0·3	1·6
vestoft ...	July 1936	—	0·2	8·7	52·9	17·4	12·1	2·7	5·0	0·3	0·2	0·6
msby	Sept. 1936	—	2·4	23·9	46·5	11·6	6·6	2·5	3·6	0·6	0·4	1·7
vestoft ...	Oct. 1936	—	1·4	17·9	47·8	15·1	7·0	5·2	4·9	0·3	0·1	0·4
vestoft ...	Dec. 1936	—	1·4	15·7	42·6	13·1	10·2	4·7	8·2	1·3	0·6	2·2

he investigations of the landings of plaice in mburg from deep-sea cutters could not be carried to the same extent as in 1935, yet more than 000 age determinations were carried out. The al number of plaice landed by cutters in 1936 is than that in 1935 and nearly reaches the minimum 932. The reason is that the 1928 year-class, which ed the greatest part of the landings in the ding year, was caught in insignificant quantities The 1929 year-class contributed about 1·2 ion only to the landings. The age-groups IV—VI, ch form the majority in the landings, were con-uted by the 3 poor year-classes 1930—1932; among se the year-class 1932 (the IV-group) yielded no re than 3·5 million individuals, the two others 2·2 1·3 million respectively. The III-group of the dium 1933 year-class contributed a comparatively large number: 0·8 million. After the disappearance of the 1928 year-class the young plaice predominate again for the first time in the landings. It is to be expected that the IV-group will also predominate next year. As this year-class, the 1933 one, is of a medium strength a somewhat greater yield may be expected than in 1936.

In addition to the year-class composition of the stock the large destruction of undersized plaice through fishery with fine-meshed gear on the young-fish grounds undoubtedly tends to minimize the yield of 1936, and a prohibition through international conventions is urgently desirable.

Reports on the plaice investigations during the year 1935 at sea (15) and at fish markets (20) were published.

2. Rate of Growth.

Denmark.

The lengths of the age-groups were about the same as in 1935.

Germany.

The growth-rate of the plaice is now comparatively great in the German Bight. The average lengths of the year-classes 1932 and 1931 correspond to those of the year classes 1926 and 1927, while the average length of the 1933 year-class (as III-Gr.), as in the preceding year (as II-Gr.), is somewhat less than that of the 1932 year-class. This is undoubtedly due to the greater strength of this year-class. The average length determination of the 1934 year-class at the age of 2 years did not permit definite conclusions.

On account of the increased growth-rate of the older year-classes the percentage in the several age-groups of plaice of marketable size has again increased. In the spring more than one third of the IV-group and four fifths of the V-group were more than 23 cm. The corresponding shares in respect of the slow-growing 1928 year-class were one tenth and one third respectively.

3/4. Marking, Transplantation, and Vitality Experiments.

England.

The results of the English plaice-marking experiments in the years 1929—32 have been worked up, and it is hoped to publish them in 1937. Occasional specimens of marked plaice from these experiments are still being returned.

An experiment on reciprocal transplantation between the Southern Bight and Scottish waters is dealt with in the report of the Northern North Sea Committee.

Vitality experiments were made on board th "George Bligh" in May and August 1936, in orde to find out to what extent plaice can survive captur by the ordinary otter trawl. Samples of plaice belo 23 cm. were put into tanks of circulating sea wate immediately after each haul had been sorted, an further samples put into the tank after the plaic had lain on deck for one hour; no discrimination wa made as to the condition of the fish, that is to say as to whether they were alive or moribund. The were kept in the tanks for at least two days. I addition, after each haul, live fish were marked an put overboard both immediately after sorting an after being on deck an hour. In all, 299 in May an 300 in August were marked at once and 269 in Ma and 256 in August after the hour's exposure on deck

The results of the tank experiments were a follows:—

Percentage number of plaice surviving after being kept in tanks for 2—3 days.
(Number of fish in each experiment in brackets below).

	Hauls						
	1	2	3	4	5	6	Tota
	%	%	%	%	%	%	%
Plaice put into tanks immediately after sorting							
May 1936	79·4	58·0	68·8	81·9	73·5	60·3	71·3
	(63)	(50)	(51)	(94)	(49)	(73)	(380)
August 1936	17·0[1])	42·0	31·6	34·0	36·9	14·8[2])	29·0
	(106)	(98)	(79)	(100)	(103)	(108)	(594)
Plaice put into tanks after one hour on deck							
May 1936	41·4	14·9	26·0	64·3	44·7	29·5	36·2
	(46)	(47)	(50)	(42)	(47)	(44)	(276)
August 1936	1·0[1])	27·6	10·1	8·9	17·9	3·0[2])	11·3
	(96)	(98)	(99)	(123)	(95)	(100)	(611)

[1]) A large oil drum was brought up in the trawl which damaged the fish.
[2]) Coal, wood and other rubbish in the trawl, the fish in bad condition.

The very much lower percentage of survivors i August may be partly accounted for by the warmth o the water in the tanks, which was high in spite o the circulation, owing to the hot sun, and the damag done to the fish by the rubbish in two of the hauls It must be remembered that plaice in tanks are kep under very artificial conditions and it is probabl that their chance of survival in their natural elemen would be greater. Nevertheless, taking into con sideration that more undersized plaice are caught i the earlier half of the year than later, the experiment show that if efforts were made to get the undersize plaice overboard as soon as possible, at least hal could be saved that are now destroyed uselessly.

Only provisional figures can be given of the recap tures of the marked plaice. Records of the Ma experiments up to December, 1936, show that 3 of those marked immediately after capture and 2 of those that had been an hour on deck have bee retaken, or 12 % and 7 % respectively. They includ 3 fish which were noted at the time of marking a

ng signs of injury. Eleven fish from the August iments have been received. They were all plaice had been marked immediately.

in previous experiments, it was found that a proportion of plaice marked below than over a. has been returned, which may have been due jury from the plaice discs. The majority of below 19 cm. were marked with smaller discs. were formerly used for hake-marks and are he size of the plaice-discs. They consist of one ebonite disc stamped EA and the number and unstamped disc. It is possible that owing to small size some may not be noticed by the rmen.

land.

ansplantations of maturing plaice from the sh to the Scottish coast and *vice versa* were ed out by the Ministry of Fisheries. Owing to the for other duties, the Scottish research vessel unable to participate during the year, but it is d to include this work in the programme of the ng year.

5. Eggs and Larvae.

land.

our plaice-egg cruises were carried out in the hern Bight and Eastern Channel area. The ts to hand indicate a considerable falling off in ners in comparison with previous years. Further in the area is desirable and is being undertaken. work on the Varne, Galloper and Sandettié ships is being continued.

many.

he plaice fry from the catches during the cruises ebruary and December was sent to the Fisheries oratory, Lowestoft, for analysis.

6. Other Investigations.

mark.

acial investigations on plaice from the Horns f areas have been carried out.

many.

omprehensive quantitative investigations into the of the plaice and other flat-fishes are in prepara- and will be published in the form of shorter papers hey are finished.

V. Common Sole.

mark.

aterial for determining the age of the sole caught he "Biologen" has been collected but has not yet worked out.

Germany.

During the cruise of the "Poseidon" in February 1936 further investigations were made in respect of the winter-distribution of the sole population.

The greatest sole catches were again made inside the 40 m.-line. The collection of material for age determinations was continued.

Investigations of sole fry was the chief object during the "Poseidon"s cruise in April/May. During the earlier investigations Ehrenbaum and Mielck had already shown that the chief distribution area of fry lay principally in the south-eastern North Sea off the East-Frisian islands, and even there the largest quantity of eggs ascertained up to now amounts to 35 per 1 m.² only. Now it proved necessary to move the field of activities further westwards, where a greater number of eggs were anticipated. In the West and East-Frisian area (westwards to Haaks L. V.) 11 and 12 are the highest numbers of eggs per 1 m.² found during our cruise. In the Hoofden at one station off Ijmuiden 33 per 1 m.² were found; at the other stations in this area there were found at the most 8 per 1 m.². The number of larvae caught was small, they were traceable in the vertical catches at only a few stations. The maximum was found at three stations in the section Haaks L. V. — Smiths Knoll L. V. with 5 per 1 m.² each; but even the largest number of larvae found by Mielck in the east Frisian area was not greater than 6 per 1 m.² (June 1930). The larvae were almost all still quite young. From the presence of larvae it can be inferred that the time for the cruise was not too early. Even though the number of eggs were less than expected, it must be remembered that the mass-outburst of Phaeocystis undoubtedly has lessened the efficiency of the vertical nets thus thwarting the quantitative utilization of the catches. The figures arrived at can be regarded as only a minimum. Furthermore, no definitive results can be expected from a single cruise only.

VI. Other Fish.

Belgium.

The routine work on Sprat (biology, fishery, and percentage admixture of young herring) was continued.

Denmark.

Age determinations were made on **dab** at most of the stations of "Biologen". Racial investigations on dab from the Horns Reef area have also been carried out. All material of species other than those mentioned above have been measured and registered.

England.

Sprat. No sprat samples were taken during the 1935/36 or 1936/37 fishing seasons, but the results of the sprat investigation of the preceding six seasons

were worked out during 1936. A report in the Ministry's series is in process of preparation and will shortly be published.

Two papers on the sprat (the first being a preliminary general account of the investigations and the second being on LEE's phenomenon) were published in the Journal du Conseil (X, 1 and 2).

A few samples of summer-caught sprats from the Clyde area were sent by Dr. A. P. ORR. Some of these sprat samples differed from those obtained on the east and south coasts of England in the winter months, in that they contained a majority of fish with food in their stomachs. In some samples the stomachs were full of food, which appeared to consist chiefly of copepods.

France.

Sprat. Continuation of investigations carried out since 1934 on the composition of the sprat shoals in the Southern North Sea and the Channel.

Sand-eel. Continuation of work undertaken.

Germany.

As usual observations were collected in respect of all food fishes caught during the fishery investigations at sea.

In connexion with the newly begun investigations as to the reproduction of the Ammodytes species in the Baltic the Baltic Department of the "Deutsche Wissenschaftliche Kommission für Meeresforschung" has used material from the North Sea also. A publication on these investigations will appear shortly.

Holland.

As to market measurements of various food fishes see B. I, 1.

Scotland.

Horse Mackerel (*Trachurus*) were encountered in fair numbers off the Berwickshire coast. — The usual routine observations were carried out on all the constituents of the trawl hauls, i. e., measurements, sex, development, food, scales and/or otoliths for age determinations.

C. SHELLFISH

France.

Oysters and edible crabs. The investigations carried on by the station at Boulogne have proved the possibility of purifying infected shellfish by an immersion of 24 or 48 hours in sea water suitably ozonized.

Germany.

Experiments were started by the "Biologische Anstalt", on the connexion between the bacterial content of sea water and of the oysters and edible mussels living therin. Rearing experiments with oysters were continued with the support of the ministries of Education and Alimentation. Settling was again obtained.

D. BENTHOS AND DEPOSITS

Denmark.

Bottom samples with the Petersen grab (0·2 m.^{3}) were taken at each of the stations of the "Biologen".

The Skalling laboratory has continued the investigations in the Danish waddensea area. Two volumes of "Meddelelser fra Skalling-Laboratoriet" have been published giving the results of several years' investigations into the insect life of the shores of the waddensea (Dr. ELLINOR BRO-LARSEN) and on plant communities of the marshland etc. (Dr. JOHS. IVERSEN).

Physiographical investigations on sedimentation and marshland have been continued by Dr. NIELS NIELSEN.

The hydrography etc. of Ho Bay will now be published (by Dr. H. THAMDRUP); the material includes weekly samples collected during two years. Biological and ecological studies of the bottom fauna of the waddensea have been continued in close connexion with the hydrographical sampling, and special efforts have been made to study the distribution and quantities of bottom animals of economical value or of special importance as food of important fishes. The last-mentioned investigations are carried out in co-operation with the 0-group-plaice investigations of the "Marinbiologisk Laboratorium"; a preliminary report has been published by THAMDRUP.

France.

Geological dredgings carried out during the cruise of the "Président Théodore Tissier" in the North Sea and the Channel have enabled the collection of a certain number of interesting samples for the study of the submarine geology of these areas.

Germany.

During the cruises of the "Poseidon" quantitative investigations on the endobioses were carried out as usual with the Petersen grab.

A detailed study of the bottom population in the area of the deep channel south of Heligoland was commenced.

The analyses of the bottom fauna of the tidal zone in the Jade were continued by an assistant of the "Biologische Anstalt", who works in the "Institut Senckenberg am Meer" in Wilhelmshaven.

The planktonic young stages of several mussel species (*Mytilus edulis*, *Mya arenaria*, *Zirphaea crispata*, *Saxicava rugosa f. arctica*, *Macoma baltica*) were identified through rearing experiments. A publication is in preparation.

A paper on the occurrence of various Cephalopods in the Southern North Sea ( ) was published. A report on the discovery of a great *Stenoteuthis carol* (*Furtado*) in January 1935 at the coast of Juist as well as morphological investigations on the individua is ready in manuscript.

otland.

The Petersen grab was utilised in the Longstone ea in an attempt to secure herring eggs *in situ*, but ccess did not attend the efforts made. Investiga- ns on the distribution and frequencies of occur- nce of the various species of *Pandalus* which were tiated in the Northern North Sea during the year re extended into the Southern North Sea during e cruises in September and October. A report on s work will appear in due course in the work of e Northern North Sea.

E. PLANKTON

elgium.

Plankton work was carried out on West Hinder ghtship together with hydrographical observations mperature and salinity at the surface and at the ttom).

At the monthly cruises on the line Deal—Grave- es, investigations on plankton and fish larvae ertical and horizontal catches) were made together th hydrographical observations (salinity and tem- rature at different depth).

ngland.

Lowestoft.

Seven plankton cruises of the research steamer eorge Bligh" and eight short cruises of the motor fter "Onaway" were made during 1936 as follows:—

1. Investigations on the ether-soluble matter of ed plankton (a) along the English east-coast area ne and October) (b) monthly observations at six tions between Flamborough Head and the south- st patch of the Dogger Bank (January to vember).

2. Plankton of the northern grounds. Three parallel es of stations across the North Sea, the northern- st line crossing from off the Northumberland coast off the Naze (May).

3. Investigations into the relation between abund- ce of plankton and hydrological conditions (May, gust and September).

4. The relation between phytoplankton concen- tions and the autumn shoaling of herring off East glia (October and November).

Observations along the monthly Hensen-net stations the Flamborough Line on two cruises, one in June d the other in October, were continued this year, area covered being the same as in former years. e distribution of the fat values for dried plankton wed similar trends in time and place to those shown h year since the Flamborough Line series was rted.

Both for the Flamborough Line and for the June d October cruises the fat values were lower than any of the years yet recorded.

Arbitrary measurements of the red-yellow pigments the Hensen catch were made each month at the mborough Line stations by comparing acetone suspensions of the plankton with potassium bi-chro- mate standards. It was found that the pigment reached a maximum in July and that it did not vary directly with the fat content.

Attention has also been given to the feeding and breeding of plankton animals and their relation to phytoplankton concentrations. For the Flamborough Line series of observations there has emerged a good correspondence between the number of ova and the amount of phytoplankton present.

Work has been continued with the Lowestoft photo- meter, which has proved satisfactory and practical for the determination of phosphate at sea. A consider- able body of data is now available bearing on the relation of nutrient salts to phytoplankton production and a report on the observations from 1934—1936 is in preparation.

The usual autumn survey of the phytoplankton concentrations in the Southern North Sea was carried out from the end of September to the end of November. *Rhizosolenia styliformis* was very scanty. *Biddulphia sinensis*, however, was present in much greater abundance than in 1935. A dense patch was found in the Thames Estuary at the end of September and a lighter patch in the neighbourhood of Tea Kettle Hole (about 53°30′ N. Lat. and 3° to 4° E. Long.). In early October the Thames concentration had appar- ently spread north-east and diminished in density, while the more northern patch had spread south-west and increased in density twentyfold. At the end of October the southern patch had disappeared while the northern one had drifted some 40 or 50 miles north-eastward and increased greatly in extent; two weeks later this patch had drifted a further 70 or 80 miles to the north-east.

The phytoplankton concentrations were never in a position where they would be likely to interfere with the shoaling of the herring; when they were nearest to the fishing ground — in early October — some of the best landings of herring came from near the western edges of the patches.

Germany.

During the cruise of the "Poseidon" in February and in April/May 1936 the surface-microplankton was examined in living condition immediately after the catch at numerous stations which are scattered over the area of investigation in a network formation. Again special stress was laid on the closest possible co-operation with the hydrographical investigations. Especially the February-cruise clearly demonstrated the characteristic winter distribution of the surface- plankton. A publication is in preparation. During the April-cruise the investigations were hampered by the mass occurrence of Phaeocystis, which clogged the nets. The Phaeocystis colonies not only of the surface but also of the deeper layers were counted.

Furthermore surface-plankton samples were taken during cruises with the patrol vessels "Weser" and "Elbe" for analysis at the "Biologische Anstalt", Heligoland.

The regular daily investigations of the plankton off Heligoland were continued. A comprehensive treatment of these observations is contemplated and a special study will be made of the influence of the Elbe water on the plankton off Heligoland. In order to obtain a general basis for this work the complete uninterrupted hydrographical material from the roadstead of Heligoland (1903—1913 and 1918—1936) is now being worked out. This will first be published separately, as well as a survey of the seasonal occurrence of the macroplankton organisms, which has been specially made for the years 1929—1933 based on investigations of the first laboratory assistent of the "Biologische Anstalt", Heligoland.

The distribution of the macroplankton in the area German Bight—Doggerbank—North-eastern edge of the Hoofden was thoroughly examined during the February cruise of the "Poseidon". The results proved in general the regularities found during previous investigations. The characteristic Channel water forms was found until the northernmost stations off Romø. The Flemish coastal form *Clytia pelagica*, having the same general distribution as the characteristic Channel-water forms could be traced as far as Amrum. Northern forms occurred unmixed in the north-western part of the area, but further south they were largely intermingled with the above-mentioned characteristic forms. A chief form of the German coastal waters (*Sarsia tubulosa*) was found off the coast of the German Bight.

During the cruise of the "Poseidon" in April/May the macroplankton showed the typical seasonal conditions, Coelenterates and larval Crustacea generally predominating.

The observations during the cruise of the patrol vessel "Elbe" in November—December in the south-western North Sea and the mouth of the Channel also confirmed the experiences of former years. A publication was prepared in respect of the distribution in winter of the characteristic forms of the macroplankton in the Southern North Sea taking into consideration the investigations made during the winter cruises of the recent years (November 1928—February 1936).

Scotland.

The methods employed were on much the same lines as in recent years. Investigations on *Calanus* were continued. The search for larval herring formed an integral part of the work. Comparison between plankton catches and the contents of herring stomachs was carried a stage further. The Hensen net was brought into use for the quantitative estimation of fish eggs. Plankton indicators of the original type were employed periodically to link up the surface plankton between fixed stations widely spaced where serial hauls at various depths were taken. Special attention was given to the occurrence of exotics in the Scottish area.

The September cruise showed a distinct shortage of Atlantic macroplankton in the North Sea. *Sagitta setosa* dominated in the catches from the Gut and Fisher Bank and was accompanied by a few *Sagitta elegans* and considerable numbers of *Calanus*. The Medusa *Tima bairdii* was common. During October *Calanus* was scarce off the Northumberland coast but young *Sagitta setosa* were extremely abundant. Some *Sagitta elegans* were also present as well as large numbers of metamorphosing Asteroids. *Limacina retroversa* occurred in most of the collections, sometimes in great concentrations as in the regions of the North East Bank and western end of the Dogger.

F. HYDROGRAPHY

Holland.

During October and November surface water samples were taken onboard the "Nautilus" on the routes Maas L.V.—Orfordness and further south.

Norway.

Observations regarding surface temperature and salinity have been taken on the steamer routes Bergen—Newcastle and Bergen—Rotterdam.

Scotland.

Temperatures in the more open sea waters of the Middle North Sea during September showed a slight persistence of summer conditions which as judged from earlier observations in the Northern North Sea were generally below normal, indicating a weak Atlantic influx. In other words, discontinuity in vertical thermal conditions towards the end of September may be taken to indicate either lateness of the spring incidence or a secondary inflow in early autumn. Homothermal conditions were in evidence at the shallower coastal stations as the usual winter hydrographic phase. In the complex area between the Farne deeps and the western end of the Dogger Bank during the first half of October thermal layering was in evidence, the discontinuity layer occurring at a depth of 50 m.

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2. Bückmann, A., Scholle (*Pleuronectes platessa*). Die relative Stärke der einzelnen Jahrgänge in verschiedenen Meeresteilen. Rapp. et Proc.-Verb. Vol. CI, 3e ptie., 1936.
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TRANSITION AREA COMMITTEE

1936.

Dr. H. Blegvad.

Denmark.

Biology. (Dr. H. Blegvad).

The vessels used for research work in 1936 were: the S/S "Biologen" (April—October) and a motor boat (July—August).

Plaice. Fishing experiments with the "Tog" were — as in former years — carried on throughout the Transition Area.

The stock of young plaice (I- and II-group) in the northern Kattegat was normal, in the central and western Kattegat slightly below normal, and in the southern Kattegat somewhat above normal. In the Belt Sea the stock of the I-group (and to less degree that of the II-group) was far above normal and in several places a considerably denser stock was found than in any of the preceding 12—15 years. These observations are in accordance with the good results of the fishery for the 0-group with the Johansen young-plaice trawl during the summer of 1935. The rich year-class 1932 (IV-group) was very scarcely represented in the catches.

Along the coasts fishing was carried out during the summer from a motor boat with the Johansen young-plaice trawl (see Figs. 1—2). Along the north-west coast of Jutland (Thyborøn—Skagen) the catches of the 0-group made were about normal (24 per 30 min. haul). In the Kattegat (Skagen—Hasenøre) the numbers of the 0-group were considerably below normal, whereas its appearance in the Belt-Sea, the Sound and the Baltic was about normal. In the Baltic proper east of Møen and Falster as well as round Bornholm, the 0-group was but poorly represented as in the year 1935. On account of these two exceedingly bad brood years for the Baltic plaice we must expect a further decrease in the plaice stock of the Baltic in the course of a few years.

The transplantations of undersized plaice from the North Sea to the inner Danish waters were continued; 100,065 kg. or about 1,149,900 ind. being transplanted to the Belt Sea, the southern Kattegat, the Sound, and the western Baltic. Owing partly to the very thin stock of young plaice in the Horns Reef Area, the quantity transplanted was somewhat lower than intended (130,000 kg.).

The transplantations of plaice from the waters off Thyborøn to the inner broads of the Limfjord were continued; 150,000 kg. or 1,656,000 ind. being transplanted.

Smaller quantities of undersized plaice from the North Sea off Thyborøn were delivered to the Swedish Government and transplanted to the eastern Kattegat and the Sound, and to the Norwegian Government for transplantation to the Oslo Fjord (see the Norwegian and Swedish reports).

Other Flatfish. Investigations as to the biology of other flatfish (especially flounder and dab) were continued. In some parts of the Belt Sea the stock of young dab, as in 1935, was more dense than was the case some years ago, this was probably due to the introduction of a size limit (25 cm.) for dab some few years ago.

Cod and other Gadides. Ring-trawl fishing in spring showed that the stock of cod larvae in the waters inside the Skaw was somewhat below normal; also the bottom stage of the 0-group (caught in the "Tog") appeared less frequently.

Herring. Investigations as to the extent of the spawning of the autumn herring were carried out as usual. Throughout the entire Belt Sea the number of larvae caught was somewhat *above* normal (during the preceding 5—6 years the number of larvae has been scarce and every year below normal) (see Figs. 3 and 4). Also the yield of the autumn herring fishery in 1936 was greater than in any recent year.

Sprat. Investigations regarding the newly established trawl fishery for sprat in the Belt Sea have been continued and its effect on the young fish (cod, plaice)

been specially studied. The results of the investi-
ons show that the sprat trawl does not catch many
ig food fishes (in some cases, however, rather large
ntities of small herrings may be caught by the
l).

ackerel and Eel. Forecasts of the yield of the
ry were published in "Dansk Fiskeritidende" (by
E J. C. JENSEN).

orwegian Prawn and **Norwegian Lobster.** Measure-
ts of catches (scientific as well as commercial) have
continued. The intensity of the fishery for these
crustaceans is still increasing.

ne Mitten-Crab has been recorded from a few
localities (estuarine waters or freshwater) but in
e specimens only; young mitten-crabs have not
been recorded from the Danish waters (apart from
rivulet Vidaa at Tønder, South Jutland).

ottom Invertebrates. As in former years valua-
s of the sea bottom have been undertaken by
ns of the Petersen bottom sampler.

ankton. As in former years, vertical hauls with
of fine gauze and with Hensen nets have been
e from various light vessels in the Kattegat and
Belts. Vertical hauls with the Hensen net were
ied out in connection with the ring-trawl fishing.

nvestigations of **Fish-Diseases** and of the dis-
of the *Zostera marina* were continued. In some
s of the northern Belt Sea the growth of *Zostera*
ina was far better than in any year since the out-
k of the disease.

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Germany.

e page 57).

Norway.

heries Directorate.

prat (P. BJERKAN). Young sprat of the 1936
r-class were subject to counting of vertebrae;
h countings were undertaken by the Directorate
Fisheries on samples from the Oslofjord as well
various localities along the Skagerak coast.
The Oslofjord samples showed numbers varying
ween 47·90 and 48·05, while the young sprat
nples from the south coast varied according to
ality from 47·70 to 47·98. Spawning takes place
hin as well as outside the fjords and this circum-
nce causes rather variable hatching conditions
respect of time and temperature etc.

Fisheries Directorate and the Society for the Advancement of the Fisheries in Oslofjord.

Plaice (JOHAN T. RUUD). By the end of May, 4 boat loads of plaice were transplanted from the Tyborön (Jutland) to the Oslofjord and the Norwegian Skagerak coast. The 4 loads were calculated to contain about 180,000 individuals (about 4,500 kg. a load). One shipment was liberated in the Kragerö-fjord, one in the Larvik-fjord and two within the Oslo-fjord: one near Moss and one inside Dröbak. 100 individuals from each shipment were marked, and recaptures until the end of 1936 amounted to: Kragerö 6 %, Larvik 38 %, Moss 33 % and the Oslo-fjord 11 % respectively.

The size-limit being 27 cm., no specimen below this size should have been taken legally. Some illegal fishing is believed to have taken place in the Kragerö-fjord and the return of recaptured fish, therefore, may not show the true recapture.

Flödevigen Hatchery.

Cod (ALF DANNEVIG). The winter has been severe and the immigration of mother-fish but minimal. When the catch of mother-fish was finished by the end of March, spawning was in full development and the quantity of roe obtained, therefore, less than expected. The hatching was successful and some 126 million fry were liberated along the coast between Lyngør and Lillesand, between March 30th and May 16th. The quantity was less than usual and several orders had to be refused.

Age-determinations were made in respect of more than 1000 cod.

During examinations of young cod, 48 specimens of the 1936 year-class only were caught, or about 0·6 individuals per haul. The corresponding means for the five previous years were 5·7, and for 1917—1935: 15 individuals per haul.

It becomes increasingly difficult to catch sufficient quantities of spawning cod; connected with the occurrence of fry in the "Skærgaard" a heavy decline in stocks is indicated.

Lobster (ALF DANNEVIG). Lobster-rearing was commenced on June 17th, but had to be stopped and a cleaning of the water establishment to be undertaken, as all fry was closely covered by suctories. Some 21,000 specimens of fry were liberated at the early stage. Fry collected after the cleansing, some 25,000 individuals, were liberated as follows: 10,000 at stages IV and V and the balance, 2,000, at earlier stages. The bulk of the lobster-fry was liberated at Kragerö.

Other species have been subject to continued vertebral countings.

Hydrography, plankton and eggs. 186 stations have been worked in fjords and coastal waters, the main field being the Oslo-fjord where full sections were worked in the first week of March, April, and May, from the Bundefjord to past Færder.

Simultaneously some 300 eggs- and young-fish-hauls were made. Investigations were continued during

Fig. 1. Number of plaice of the 0-group (year-class 1936) taken per fishing unit in the summer of 1936. The fishing unit used was a 30 minutes' haul with Johansen's young plaice trawl.
German data received too late for insertion, see Fig. 6, p. 57.

g. 2. Number of plaice of the I-group (year-class 1935) taken per fishing unit in the summer of 1936. The fishing unit used was a 30 minutes' haul with Johansen's young plaice trawl.
German data received too late for insertion, see Fig. 7, p. 57.

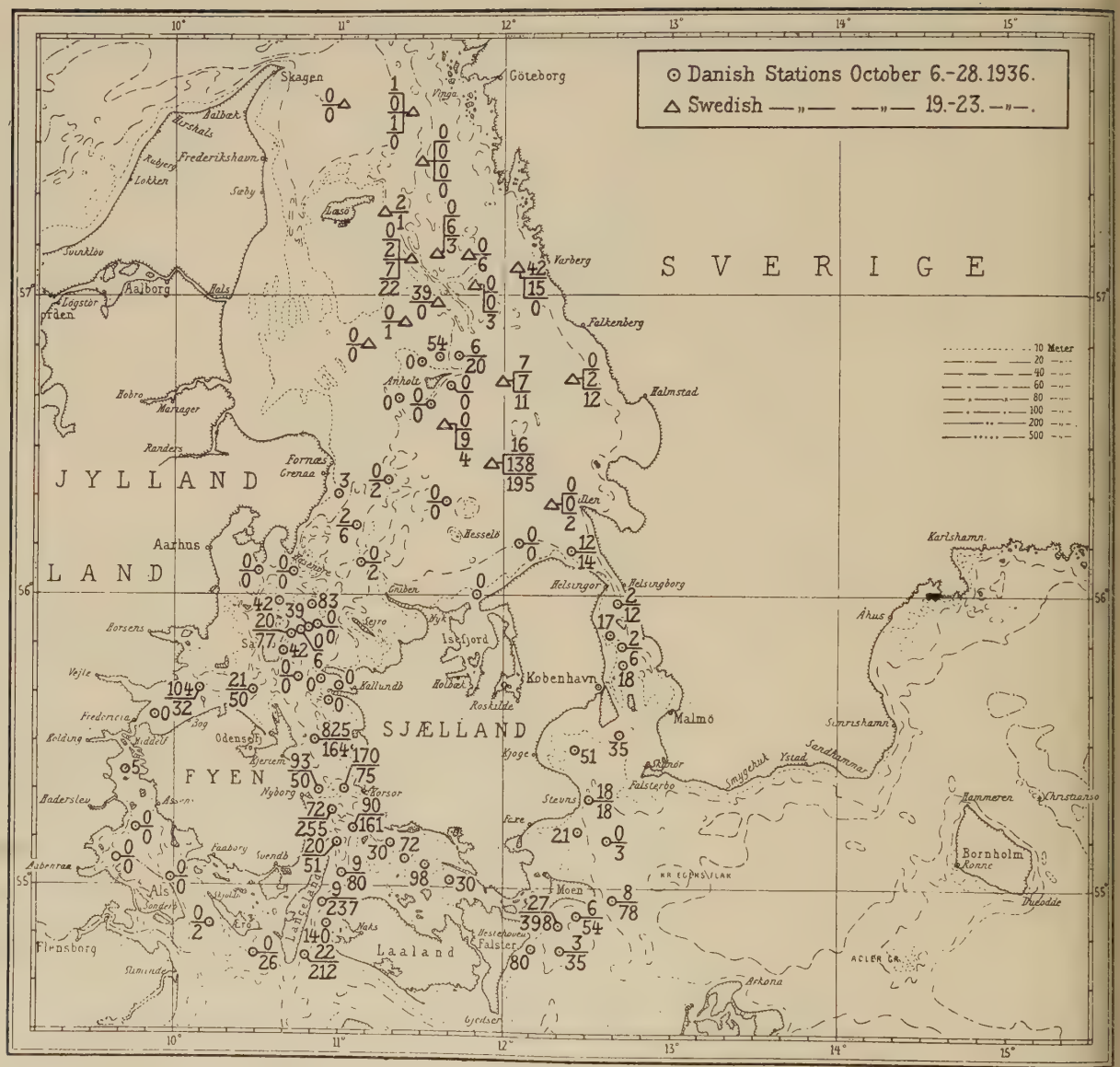


Fig. 3. Total number of herring larvae taken per 30 minutes' haul with a 2 metres stramin ring trawl in the autumn of 1936. — Where more than one figure is given at one station, the upper figure indicates catch in the upper layer (0—15 metres depth), the lower figure catch at the bottom, and figures between the lines catch in the intermediate water layers.

October in connection with examinations of coastal fry. The hydrographical section was repeated during the latter half of December.

Publications.

Alf Dannevig: "Hummer og Hummerkultur". Fiskeridirektoratets Skr., Report on Norwegian Fishery and Marine Investigations, Vol. IV, no. 12.

Sweden.

The R/V "Skagerak" has been at disposal for biological investigations for some 7 months during 1936, while the M/V "Clupea" of the Lysekil Laboratory has made investigations in the Bohuslän-fjords.

Haddock. Collection of statistical data on landings in the port of Gothenburg has been continued, as also the

Witch has been the subject of similar investigations.

Plaice. Johansen's young fish trawl hauls have been made along the west and south coast and the numbers of the 0- and I-groups have been inserted, for each station, on the charts (Figs. 1 and 2). In general, the 0-group scarcely appeared and it was practically never caught at the south coast.

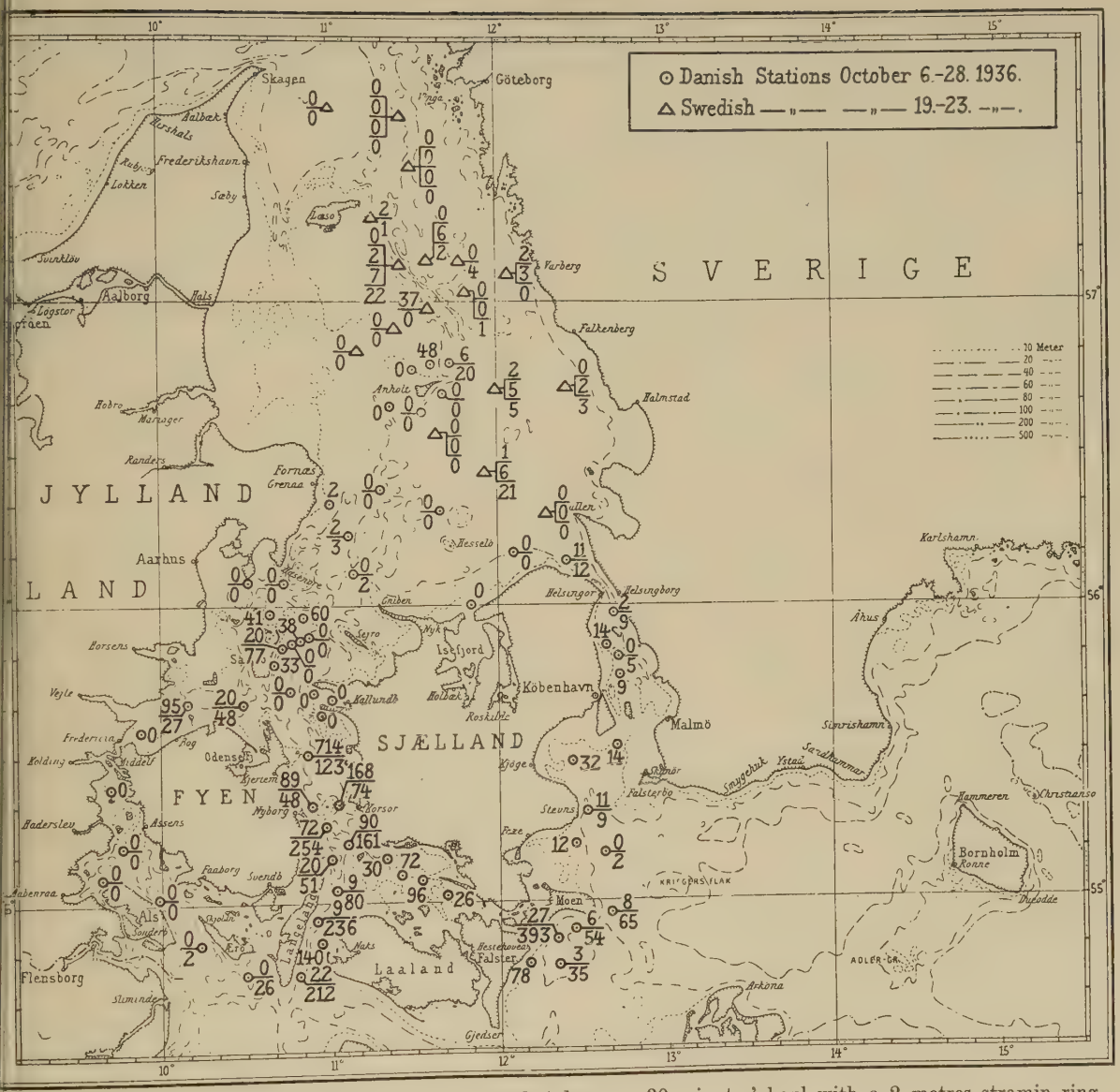


Fig. 4. Number of herring larvae of 5—9 mm. length taken per 30 minutes' haul with a 2 metres stramin ring trawl in the autumn of 1936 — For explanation of figures, see Fig. 3.

Transplantations took place in 1936 from the Danish est coast to Swedish waters; 40,000 individuals were berated in Hafstensfjord (Bohuslän) and 36,000 off he Halland's coast from Falkenberg south to Båstad nd in the Skeldervik. Some 1100 were marked. Due o unfavourable weather conditions the liberations ere delayed to the end of May and early June. With gard to recaptures of marked fish, the highest per-ntage (12·6) is recorded from the Bohuslän, while nat of the southern Kattegat to-day (end of January 937) is considerably less. The experience of the year shows a very good growth of transplanted plaice. Due to fishermen's lack of care many individuals were caught shortly after liberation.

Investigations of stock in the southern Baltic have been continued.

Flounder. Records of the appearance of 0- or I-groups of flounder were made in addition to the above-mentioned examinations on plaice along the coasts of Scania and Blekinge. The 0-group of flounder was poorly developed — even less satisfactory than in 1935, when it was also weak. Very probably the poor

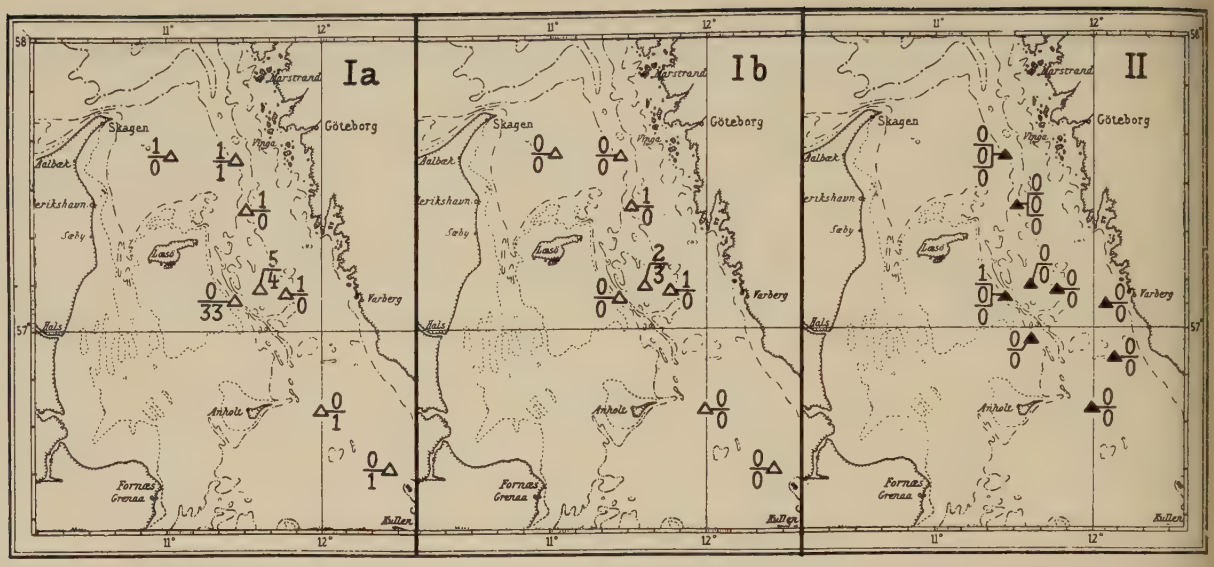


Fig. 5. Number of herring larvae caught between January and March. Ia. Total Number caught in January. Ib. Larvae of 5 to 9 mm. caught in January. II. Total number of larvae caught in March.

recruitment of the flounder stock in two successive years will influence the yields of the fishery in coming years.

Sprat. Laboratory work has primarily been concentrated on examination of material collected since 1930. During 1936, a special service was introduced to report daily on the sprat fishery as to catches on the various fishing grounds, and this service has made it possible — better than before — to follow the local variations and the connexions between the fishery and hydrographic fluctuations and plankton exchanges in Bohuslän fjords.

Collection of material in order to follow fluctuations in year-classes and composition of stock has been extended considerably.

Investigations as to horizontal as well as vertical distribution of sprat eggs and fry in the Skagerak, the Kattegat and the Bohuslän fjords have been finished and the results are ready for publication.

Monthly plankton hauls within and outside the Bohuslän "Skärgård", started in August of 1935, to examine the food-supply of sprat, have been continued. The material is being examined.

Norwegian prawns (*Pandalus borealis*). Trawl hauls with nets of various mesh-widths were made from the S/S Skagerak.

Cod. The good cod-fishery around Bornholm has been subject to attention and analyses as to age- and size-compositions have been made.

Herring. 2 m. ring-trawl hauls for herring fry were made in Kattegat during January and March (Fig. 5), and October/November (Figs. 3 and 4).

During the January expedition (16th to 19th) eight stations were investigated, but the yield of fry was very poor — 0 to 5 specimens per 30-min. haul. One station only gave a better result: near the Kobbergrund 33 individuals of 20—30 mm. length were caught in one haul at 20—30 m. depth.

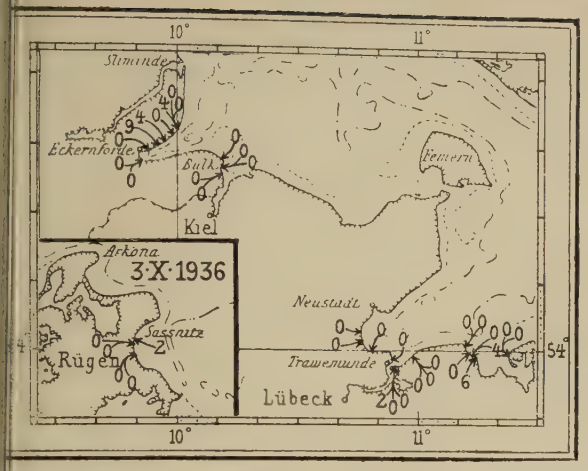
March hauls (9th—11th) gave negative results. Twenty-one 30-min. hauls at 9 stations gave 1 individual only (length 22 mm.).

Between October the 19th—23rd, 17 stations between Kullen and Winga were taken. One station only (about 10 miles SW of St. Middelgrund) showed greater numbers of herring fry — this haul was made at night; all other stations — made by daylight — gave but poor results, all inferior to last year. The night-haul mentioned agrees in respect of quantity with A. C. Johansen's conclusions from his 1925-investigations; as regards vertical distribution of herring fry, however, the result recorded is definitely adverse: surface hauls gave but few specimens, the bulk was caught at 10 m. and especially at 20 m. depth. This observation caused serial hauls at 4-hour intervals to be prepared through 24 hours; these were taken on October 31st—November 1st E. of Fladen Ground and on November 4th—5th W. of Nidingen L. V. — The yield from these hauls was exceptionally large — in certain hauls more than 800 individuals per 20 minutes haul, a fact which indicates that the October hauls were taken too early. With regard to the vertical distribution unexpected results were attained and they did not agree with those obtained by Johansen in the spring of 1925. A full report on the 24-hour serial hauls concerning herring fry as well as plankton organisms is being prepared.

Samples have been preserved for race- and age-analysis.

Publications.

Arvid R. Molander: Neue Untersuchungen über die Flunder in der Ostsee. Svenska Hydrografisk-Biologiska Kommissionens Skrifter, Ny Serie, Biologi, Bd. II, Nr. 1.



g 6. August 1936. Number of plaice of the 0-group in catches with Johansen's young plaice trawl. 30 minutes haul.

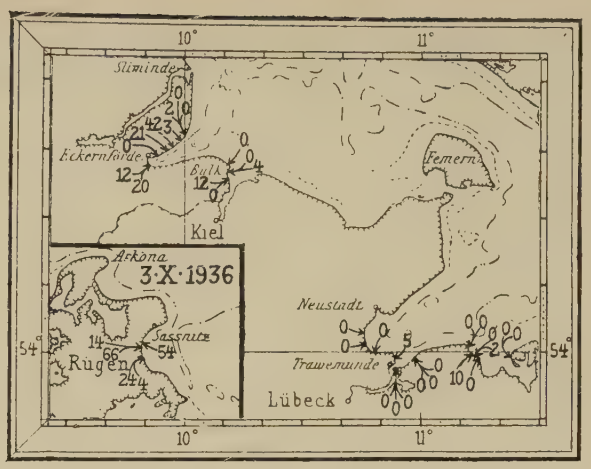


Fig. 7. August 1936. Number of plaice of the I-group in catches with Johansen's young plaice trawl, 30 minutes haul.

Germany.

altic Department, Hamburg. (Dr. S. Strodtmann).

In the year under review three cutter cruises were ndertaken, two into the area of the Pomeranian ight, one into the western Baltic.

Plaice. The usual young-plaice investigations were rried out with the Johansen net, in the beginning August, at 4 localities in the western Baltic (Eckernrde, Kiel, Travemünde, Wismar). In 31 hauls of hours' duration 56 plaice of the I-group and 12 aice of the 0-group only were caught (Figs. 6 and 7). ven if bad weather conditions account partly for e bad fishing results, the proportion between the o age-groups clearly shows that the plaice brood 1936 is extraordinarily weak. The preceding ar was evidently somewhat better. The catches ith the "Schiebehamen" (hand push-net) gave single dividuals of the 0-group only, but a haul with the l seine off Travemünde yielded greater numbers. close investigation showed that 18.4 % of these shes — originally taken to be plaice — were hybrids tween plaice and flounder.

In the coastal waters off Pomerania the 0-group plaice was very scarce. Although we fished peatedly with the "Schlepphamen" (tow-net), from ly to November, on the coast off Kolberg, we caught plaice only of the 0-group, among many small under and turbot. Hauls at sea unto 35 m. depth ve no results, yielding a single small plaice only. he results off Sassnitz were hardly better, 5 coastal uls gave 1 plaice only of the 0-group, 5 hauls with e shrimp-net at depths of 19—20 m. gave 10 ind. A comparison of the results of the last 3 years, the area east of Sassnitz, gives the following means r the 30-minute hauls with the shrimp-net.

1934	242	plaice of the 0-group (6 hauls)
1935	20	plaice of the 0-group (5 hauls)
1936	4	plaice of the 0-group (5 hauls)

These figures give an idea of the fluctuations which the brood production suffers from one year to the other. The year-class 1935 was much poorer than the rich year-class 1934, but still remarkably better than that of this year. In conformity herewith fairly many I-group plaice were caught. The hauls off Sassnitz with the Johansen net yielded an average of 26 individuals (in 30 minutes), those with the shrimp-net 20 individuals. Off Kolberg the catches of the I-group were smaller.

In the area between Sassnitz and Kolberg the 1934 year-class was, as in later years, extraordinarily dense. Even in such areas where the young flounders otherwise predominate, as for instance in the inner bay of Swinemünde and in the Greifswalder Bodden, they were by far outnumbered by the plaice. Although only the largest specimens reached the legal minimum size, the 1934 year-class was an important object of the fishery. In some places (a. o. Sassnitz in September) 10 times the amount of the preceding year was sometimes landed. Unfortunately, the catch being composed almost solely of this one year-class, the quality was not satisfactory. Even off Sassnitz where the growth was best, at the end of the summer 90 % of the catch were below 25 cm. Off Kolberg conditions were even worse. At the beginning of July 1 % of the catch only were relatively large. Unfortunately a large amount of undersized fish were destroyed through this fishery; according to information received from fishermen, 90 % had to be thrown over board — this is in keeping with our investigations into growth in this area. It is therefore to be welcomed that, on September 16th, the minimum size was raised to 23 cm. which means an effective protection of the stock. The result of the plaice fishery off Sassnitz decreased from the first to the last part of September about 50 %, off Kolberg even to 10 %. But this loss will certainly be more than outweighed this year.

The prospects for the plaice fishery in the eastern Baltic during the next year will be good, as it can be expected that a larger part of the rich 1934 year-class has escaped destruction. Even if it is not caught in so large numbers as in the preceding year, its value will be so much higher. 1938 and still more 1939 will again show a decrease in the yields of the plaice fishery in these waters, since 1935 was but average and 1936 a poor brood year.

Flounder. Although, according to the official statistics, the total catch in the Baltic almost equals that of last year, the fishery yields of the eastern part showed a very marked decline. In Swinemünde and Kolberg during some months the landings reached 33 % to 25 % only of the preceding year. This is due to various causes: the large cutters have turned more and more to more profitable fisheries (sprat and herring); the intensified plaice fishery contributes to diminishing the flounder catches, the feeding grounds for the two species not always being the same, and, above all, the accumulated stock which yielded large catches in later years, specially to the East-Pomeranian fishermen, is now fished out. In the area of the southern Bornholm basin the fishery depends now on the annual recruits; these, however, are subject to fluctuations, though not so great as in the case of plaice.

The June-July cruise added considerably to our knowledge of the biology of the flounder. For the first time we succeeded in catching large numbers of larvae in the eastern part of the Baltic. They occurred chiefly somewhat far off the coast at depths of more than 20—30 m. They kept near the lower limit of the warmer upper layer (5—10 m.). They had about reached the metamorphosis stage and belonged undoubtedly to the deep sea flounder. They were en route from the spawning places of the Bornholm basin to the coast where they seek the bottom in more shallow water.

Turbot. Of the turbot transplanted in 1935 from the Oder Bank to the North Sea, 3.7 % were recaught in the first year, 4.3 % in 1936 which shows that the fish have adapted themselves fairly well to the new environments. The growth, however, was not greater than in the native waters. 14—20 months after liberation a maximal growth increment of 7—8 cm. only was ascertained. At the time of transplantation the fish were probably too old; the experiment ought to be repeated with younger fish.

It is further remarkable that we could ascertain in the Bornholm area, in June-July, the occurrence of numerous pelagic turbot larvae; the first bottom stages were found simultaneously.

Herring. In June-July we found in the Pomeranian bight a large number of 2 cm. long herring larvae. They occurred exclusively near the coast and belonged undoubtedly to the spring-herring, the spawning grounds of which in this area are not well known.

Ammodytes. During the year Dr. KÄNDLER has continued his investigations into Ammodytes. First of all, he succeeded in throwing light on the spawning conditions of the several species and furthermore he found that the species *A. tobianus* and *lanceolatus*, already known in the Baltic, are chiefly coastal forms. The wide area of the open Baltic is inhabited by the species *marinus* recently discovered in Scottish waters. The spawning periods of these species differ; *marinus* spawns during winter, *lanceolatus* during early summer. Like herring the *tobianus* show two races, one spawning during spring, the other during late summer. Consequently, quite young Ammodytes larvae may be caught almost throughout the year — a fact which formerly could not be sufficiently explained.

Egg-net hauls from the Fehmarn-Belt lightvessel were continued three times a month during 1936. The results will be published in the near future.

Report by Dr. FISCHER.

The investigations carried out up to 1933 — without clear results, however — with regard to the local forms of the spring-spawning **herring** of the western Baltic, the Schley and the Dassower Sea have been taken up again this year and are intended to last for some time in order that information may be gained as to the Vert. S. being constant or variable within the same spawning period, and from year to year. Two samples of Schley herring gave the following results:—

Beginning of April 1936..... 460 ind. 55.62 ± 0.030
3.VI.1936..... 455 ind. 55.40 ± 0.033

The difference between the mean values is 0.22 ± 0.05.

Further, two samples of spring-herring from the Dassower Sea are available:—

Beginning of April 1936..... 470 ind. 55.66 ± 0.032
12.V.1936 ..... 474 ind. 55.65 ± 0.032

The difference is only 0.01 ± 0.05.

Furthermore, material for vertebral counts was collected of 0-group herring from the Schley and the Dassower Sea, and a comparison of the Vert. S. of spawning herring and their progeny is intended to be made.

The age analyses of herring mentioned in the programme of the International Council have been continued in the western as well as the middle Baltic.

Market measurements are dealt with in the report of the Baltic Area Committee.

The transplantation of North Sea **plaice** into the Baltic has been continued in 1936. As in the preceding years the Kiel and Lübeck bights were stocked with North Sea plaice. In addition to the usual sizes (20—23 cm.), this year also larger plaice (up to 35 cm.) were transplanted. This transplantation of older and larger North Sea plaice aimed at stocking the Baltic with fish that would spawn in the first year after transplantation. Until now, no records are known of

nsplanted young fish having attained maturity, cept in one, rather long ago. The experiment with ler fish seems to be successful; for we have already gained quite a number of marked North Sea plaice m this experiment, with an ovary clearly showing e approaching spawning.

This year we also tried to solve the question whether successful transplantation of plaice seems to have tter prospects in autumn than in spring. North a plaice transplanted in spring remain during almost e whole summer in the coastal area, where frequently, d soon after liberation, they are caught by the l-net fishery. The liberations in autumn did not lfill expectations because, in this case too, the fish proached the coast and were likewise caught in e gill-nets. As a control, Baltic plaice from the Kiel d Lübeck bays were marked simultaneously, in ring as well as in autumn.

As regards the technique of transplantation, r. Meyer has devised great improvements. In the ansport boxes the North Sea plaice are packed into adder-kelp and during the 5-hour road transport ey are kept moist by sea water, instead of melting e. For this purpose, tins are put on the pile of xes; they are filled with sea water and have fine les in the bottom, through which sea water streams ntinuously to the plaice in the boxes below. The ethod was conspicuously successful. We attribute is success to the steady temperature and to the sence of fresh water.

The **flounder** of the Hiddensee and Mecklenburg asts, — for some years already the object of r. Meyer's researches, — have been further investiated. Last year's results — based on recaptures from astal flounders, which had been marked for several nsecutive years — confirm the hypothesis, suggested st year, that we have here a special flounder, of ery quick growth, which lives and spawns close to e coast, and many females of which mature in their ird year (as II-group) and attain a length of 27—8 cm. and more. Extensive migrations of this flounr between Fehmarn and Kolberg were further scertained. To judge from the recaptures of marked sh, these migrations must have taken place in the mmediate neighbourhood of the coast. In order rther to elucidate the biological conditions, morphological investigations and studies of eggs have been made.

The investigations into the spawning of the **Baltic shrimp,** *Leander adspersus*, in the bay of Wismar, which have been carried out during several years, have now been finished by Dr. Meyer; the results have been published in the "Zool. Anz." 1937. In general it was found that a small percentage (8 %) of mature females spawns twice during the spawning period — July/Sept., as ascertained in previous investigations. They were mostly larger and older individuals. Spawning in winter was not observed. Compared to the spawning periodicity and the amount of eggs of the North Sea shrimp *Crangon vulgaris*, the stock of *Leander* in the bay of Wismar is more exposed to adverse conditions than the stock of *Crangon* in the North Sea. The effect of the fishery on the stock of these shrimp must therefore be judged differently.

A close investigation was also made of the **biological** and **hydrographical** conditions of the Kiel Bight for studying, i. a., the question of the influence of polluted or "infected" grounds on the stock of fish and specially of plaice. The investigations comprise the water, plankton and bottom fauna. The material has been collected on monthly cruises of cutters.

The cooperative investigations by Dr. Meyer and Dr. Krüger on the fauna and biological productivity in the bay of Wismar are now finished. In the bay of Wismar two ecologically different zones were ascertained:— a zone with Baltic water of relatively higher salinity and chiefly marine fauna (the outer bay), and a zone with Baltic water of low salinity and a typical brackish-water fauna (the inner bay, Salzhaff and Breitling). The following communities prevailed in the bay:— (a) the community of the hard sand bottom of the outer bay with sporadical growth only (*Litorina litorea*/*Idotea baltica* community), (b) the community of the sandy and muddy brackish water with strong growth (*Litorina rudis*/*Idotea viridis* community), and (c) the mud community of the Wohlenberger Wiek. In respect of biological productivity the bay of Wismar must be classed among good waters of importance for the yield of the fishery.

The investigations into the **eel** of the western Baltic were continued.

BALTIC AREA COMMITTEE

1936.

By

K. A. Andersson.

The work during this year was mainly devoted to the study of herring, sprat, flounder and cod. The stock of cod in the Bornholm region was still very strong and gave very large catches. The stock of herring off the east coast of Sweden was also very rich.

The following are the reports of the work carried out in the area by the various countries.

Denmark.

Biology. (H. Blegvad).

Investigations were carried out from the "Biologen" during the latter half of July.

Plaice. In good accordance with the results of the fishing experiments of the two previous years the II-group (year-class 1934) was found to be rich on the Oder Bank and its surroundings. In the somewhat deeper waters round Bornholm this year-class was not yet caught in any appreciable number; on the whole the plaice population was very poor round Bornholm. In the waters east of Rügen no specimens of the 0-group were found either in deeper or in shallow water. In the coastal waters off Bornholm some few specimens of the 0-group were found (Fig. 1).

Flounder. A few specimens of the 0-group were found in the coastal waters off Rügen. Its occurrence at Bornholm appears from Fig. 1; here the 0-group was very rich.

Turbot. Some few specimens of the 0-group were found round the coast of Bornholm.

Cod. East of Rügen the 0-group was very scarce while the occurrence of the I-group agreed well with the abundant appearance of the 0-group recorded in 1935.

Valuations of the sea bottom were carried out round Bornholm and east of Rügen.

Hydrographic observations were made in the waters east of Bornholm (see the report of the Hydrographical Committee).

The Food of the Herring.

The investigations started in 1932 have been continued, and a report by Dr. Jespersen is in press.

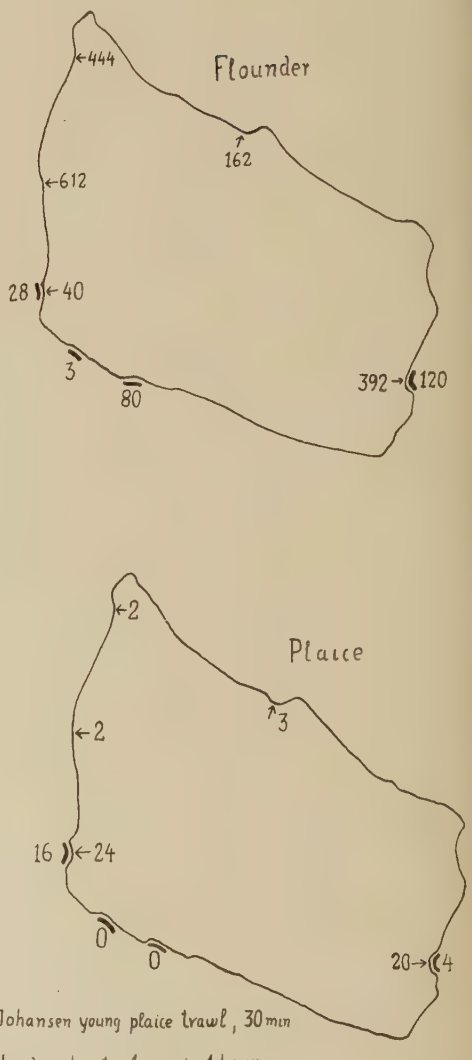


Fig. 1.

Finland.

blogy. (T. H. Järvi).

Material for scale-analysis of salmon has been col-ted as before (see the Salmon and Trout Com-ttee). Statistics of the seals killed in the Gulfs of thnia and Finland were collected.

drography. (G. Granqvist).

1) Regular observations were made as follows:
Surface temperature daily, surface salinity every 5th day, temperature and salinity at different depths every 10th day at 27 coastal stations and 9 lightships.
Surface temperature and salinity by liners from Finland to Denmark.
Currents at three depths thrice daily at 9 light-ships.
Registration of the sea-level at 17 stations and readings of the sea-level at 20 stations.
Records of ice conditions from journals and sketch-maps at about 100 stations and by all Finnish ships in the Baltic.
2) A hydrographical cruise was made in Sept.— t. 1936 in the Baltic north of Gotland, during ich 62 stations were made. On this cruise samples the determination of chlorinity, oxygen, and alkali erve were collected. In addition determinations of drogen-ion-concentration were made on board.

Germany.

(See page 63).

Latvia.

atistics. (V. Miezis).

The Board of Fisheries and Pisciculture inistry of Agriculture) continued the statistics of fisheries as in former years. The "Bulletin stat-ique des pêches maritimes de Lettonie, année 1934" s been published. The statistical materials for 1935 d 1936 will be published shortly.

ology.

The Fisheries Laboratory (Ministry of Agri-lture) continued the investigations of Salmon and a Trout through marking experiments, and age and owth determinations.
Also investigations were continued about the floun-r, and research with regard to the herring and sprat the Latvian coasts were taken up.
The Hydrobiological Station of the Latvian iversity (Director Prof. Dr. Embrik Strand) con-ued its researches regarding the fish and the plank-n of the Latvian coastal waters and of the Gulf of ga. Some notes were published.

Poland.

(M. Siedlecki).

In spite of the fact, that during three months the earch vessel "Eva" was not at the disposal of the rine Station, because of necessary repairs and re-constructions, the investigations were continued according to the programme adopted at the last meeting. Fishery investigations were very often carried out on ordinary fishing vessels and with fishing gear used for commercial fishery. On these occasions the action of one kind of small trawl, used for catching viviparous blennies — *Zoarces viviparus* — (Polish name: kwapa) was closely studied especially as to its action upon small flatfish.

The following investigations were carried out:

Biology.

Investigations of the fauna of the Polish waters were continued; 20 species until recently unknown from this part of the Baltic were found and described.

The distribution of the bottom fauna in the Polish inshore waters was studied and the results were published by Mr. Demel in "Arch. polon. d'Hydrobiol. et de Pêches", Vol. IX, 1936.

The fauna of parasites from fishes and molluscs was studied by Dr. Markowski and Dr. Miss Janiszewska. The blood vessels of the plaice were studied by Dr. Biborski. Results were published in the "Bull. Intern. de l'Académie Polonaise des Sciences et des Lettres" — Kraków, 1936.

Fishery.

Sprat. Studies on the wanderings of the sprat shoals were organized. In the port of Hel every fishing vessel returning from the sea furnished indications as to locality of capture of sprat, the character of shoals (compact or scattered), and the depth at which hauls were made, with observations as to temperature of the water, currents and water levels. The figures were recorded on numerous maps of this part of the Baltic.

Preliminary results of these investigations can be summarized as follows: In the autumn, from October till the middle of December the shoals of sprat are to be found in the upper water layers. They move with the main superficial currents caused by the prevailing winds. Gradually and according to the cooling of the upper water layer the shoals descend to deeper parts of the sea. — In winter, from December to March, the shoals are to be found near the bottom, where the water keeps a higher temperature; they move with the bottom currents. — In spring the higher temperature of the surface water draws the shoals, but they begin to disperse and gradually they go to the open sea. Investigations into sprat migrations will be continued.

Studies on the nourishment of sprat were made in the following way: Every week samples of sprat were taken from catches and the content of 100 stomachs and guts were analyzed and compared with simultaneous plankton hauls. The preliminary results of these investigations are as follows: from the beginning of the winter (end of November) and during the winter months the shoal-forming sprat take very little food. The guts are sometimes quite empty. In April the fish begin to take food for short periods,

i. e. for one week; the short periods of feeding are succeeded by short intervals of starving. By May the period of intensive feeding begins and lasts until September. In autumn periods of starving succeed brief periods of feeding till finally the winter-period of very scarce nutrition begins.

The qualitative analysis of the contents of stomachs revealed that the Copepods form the chief food of the sprat in winter, in springtime *Cladocera* are consumed in similar quantities. In summer *Cladocera* or Copepods are found as prevailing in the stomach content, according to the depths at which the fish were caught. Sometimes representatives of bottom fauna, *Mysis* and even *Foraminifera* were found in the stomachs.

The qualitative and quantitative composition of the plankton hauls does not correspond with the composition of food as stomachs chiefly contain larger animals, while small planktonic forms are absent. It is probable that the sprat makes a choice meal from amongst the plankton animals.

Herring. Every month samples of fish (100 individuals) taken by means of ordinary fishing gear were analyzed and their length, weight, sex, age and fat-content were determined.

Distribution of two herring races (the spring- and the autumn-spawning race) was studied. It was established, that the autumn-spawning herrings were caught in noticeable quantities in September and October at depths of 10—20 m. in the neighbourhood of the peninsula of Hel. At the same time, in the deeper part of the Gulf of Danzig (65—95 m.) good catches of spring-spawning fish were made with ordinary trawl.

Studies on the distribution of herring larvae have been begun.

Cod. Studies on the cod from the Gulf of Danzig were continued. Age, rate of growth, sex, mode and conditions of spawning, and the food of this fish were investigated. 451 individuals were marked and liberated in the Gulf of Danzig.

Flounder. Marking experiments were continued and 518 flounders were liberated in different parts of the Baltic (250 in Latvian waters).

Comparative studies on the flounder from the North Sea and from the Baltic were organized. 2740 otoliths were collected from measured fish. The rate of growth of the North Sea flounder was, in accordance with previous investigations, found higher than that of the Baltic flounder. In the Baltic the rate of growth is slowest in the Gulf of Danzig. It is probable that this particularity is connected with the poorer bottom fauna of the Gulf of Danzig, as was stated by comparative studies of the bottom fauna executed by means of the Petersen bottom sampler.

The spawning seasons of flounder were determined. In the western North Sea spawning takes place in February, in a Norwegian fjord (Trondheim) in March, in the Gulf of Danzig in April and May and near the Latvian coast in June.

The number of vertebrae was determined as follows: The highest average number was recorded from the Latvian waters: 36·83; in the Gulf of Danzig the average number amounts from 35·66 to 35·83, while in the Trondheimfjord it is 35·15 and in the south-western North Sea 35·07.

The composition of catches of flounder made with the commercial trawl in the Gulf of Danzig, as to the age-groups, was found as follows: II-group 15 to 20%, III-group 44 to 55%, IV-group 23 to 36%, V-group 1 to 3%, VI-group about 1%.

The food of flounder was investigated; 1650 guts taken from flounder caught in different months were studied. These investigations will be continued.

Salmon investigations as well as **Plankton** and **Hydrographic** investigations are reported in the reports of the respective committees.

Sweden.

The investigations at sea have been very limited, because the old research motorboat "Eystrasalt" was transferred to other work. A new motorboat for fishing investigations in the Baltic is to be built, but it will only be ready at the earliest in June 1937. Thus the Swedish investigations were very much hampered during the year under review.

The research steamer "Skagerak" made one cruise to the Baltic in September.

Biology.

The investigations were mainly confined to the herring and the flatfishes.

Herring. A number of herring samples from different parts of the Swedish coast were collected and examined as to length, maturity and year-classes. The year-classes of autumn and spring-spawning herring from 1929 and 1930 respectively were still very abundant and supported a great fishery along the east coast of Sweden. Through the courtesy of Director V. Miezis, Riga, a herring sample was sent from the coast of Latvia to Stockholm. This sample also indicated clearly that the same year-classes dominated on the east coast as on the west coast of the Baltic.

Flounder. Investigations on the flounder were carried out in the Bornholm region, where fishing experiments were made in order to study the stock. Along the coast of Blekinge and Scania the 0-group was poor. The 1936 year-class seems to be very week.

Turbot. In accordance with the programme adopted at the meeting in 1936 a number of small turbot were transplanted from the northern Gotland waters to the Bornholm region in June and July. The specimens were liberated in good condition and about 450 individuals were marked. Simultaneously a number of flounder were also transplanted.

Cod. In the Bornholm area in deep water the stock was still very rich and the catches continued to be extremely good. Samples were collected from this area in order to study the age composition.

Salmon and Sea Trout. See the report of the Salmon and Trout Committee.

Hydrography.

See the report of the Hydrographical Committee.

Literature.

A. Andersson: The Herring in the Skagerak, the Kattegat and the Baltic. Rapp. et Proc.-Verb., Vol. C, 1936.

David R. Molander: Neue Untersuchungen über die Flunder in der Ostsee. Svenska Hydrogr. Biol. Komm. Skrifter, N. S., Biologi, Bd. II, 1.

Germany (E. Fischer).

The market measurements of **plaice** landed in the Baltic harbours were continued in the year under review, though in a somewhat limited degree in the western and middle Baltic. The conditions on the East-Prussian coast, on the other hand, were studied more closely. The investigations into the market findings were extended to include cod and turbot. The appearance of the extremely rich 1934 plaice year-class showed how important is continuous observation of the markets. We were able to see how this year-class appears in steadily increasing numbers in the catches and could recommend measures for the greater protection of this year-class. The market measurements were supplemented by cruises on board cutters fishing with fine-meshed gear, in order to obtain an idea of the stock of unmarketable sizes. Furthermore, similar cruises were made into the Bornholm basin, during the spawning period of 1936, as well as of 1937, with a view to studying the composition of length and age-classes of the spawning shoals.

In order to throw light on the biological conditions of the flounder in the east of our area, flounders were marked off the coast of East-Prussia as well as in the "Frisches Haff". The results of the flounder markings in the Frisches Haff were what we expected. Before the advent of maturity all flounders left the Haff, and it is thus clearly proved that all flounders in the Frisches Haff have immigrated from the Baltic. This explains the extraordinarily irregular catch of flounders in these waters. Marking of **cod** was also begun.

A special study has been made of the new methods of catching **herring** and **sprat** in the Baltic with trawl nets, specially a net hauled by two boats. The chief issues were to find out whether (a) this fishery is likely to harm the stock seriously, especially that of herring, by catching the smaller individuals, or (b) whether the use of fine-meshed nets will harm the stock of the other food fishes of the Baltic by catching the youngest year-classes. The practical investigations are complete to a certain stage, the working up of the material is being continued.

Reports of other Committees.

HYDROGRAPHICAL COMMITTEE

1936.

Prof. MARTIN KNUDSEN.

Belgium.

S. North Sea.

A report of the Belgian hydrographic work during 1936 will be found in the report of the Southern North Sea Committee (this Vol. page 36).

Denmark.

North Western Area.

During the cruise of the "George Bligh" to Iceland and to the Denmark Strait from June 11th to July 21st, hydrographical observations were carried out at 34 stations. Amongst these were the stations of the 4 permanent sections (cfr. Rapp. et Proc.-Verb. XCIV, 2°, p. 64), and 11 stations in the Denmark Strait.

The four permanent sections at Iceland have been run by Danish and Icelandic patrol cruisers in the following months:

Selvogr: March, May, September.
Vestre Horn: March, August.
Langanes: August, November.
Kögr: August, November.

Surface observations of temperature and salinity have been continued from liners to Iceland and Greenland.

An investigation, planned to last one year, of the temperature and salinity of the surface water in Icelandic Fiords, has been commenced. The observations are carried out from coastal liners.

Based upon the records collected by the Danish Meteorological Institute, a study of the surface temperature at Selvogsbanki has been made by HELGE THOMSEN (Appendix 10). According to this examination the temperature has been definitely above normal in 1936.

At East Greenland hydrographical investigations have been carried out at 18 stations by the survey-ship "Hejmdal".

S. North Sea.

Surface observations of temperature and salinity have been collected from the line Esbjerg—Harwich as in previous years.

Daily observations of temperature and salinity (with hydrometer) from the lightships "Horns Rev" and "Vyl" have been undertaken by the Danish Meteorological Institute as in previous years.

Transition Area.

During the months of April and May hydrographical investigations were carried out in the Western Baltic. The observations comprised:

1) Current measurements with the Jacobsen current meter every 4th hour from the lightships "Drogden", "Gedser Rev" and "Fehmarnbelt".

2) Current measurements with the Ekman-Merz current meter, and observations of temperature and salinity in 2 sections between Rødby Havn—Puttgarden Riff and Gedser Rev—Wustrow respectively. These observations were carried out from Captain A. TROLLE's motor vessel "Thor", kindly placed at disposal for the Hydrografisk Laboratorium during the 2 months.

3) Sea level records at Rødby Havn.

Observations of temperature and salinity — and at a few stations of oxygen also — have been carried out from the "Biologen" in close connection with the biological investigations, mainly during the months of April and October. All observations except those from Limfjorden will be published in the Bulletin Hydrographique.

By the Danish Meteorological Institute regular hydrographical observations have been carried out as follows:

1) Daily observations of temperature and salinity (by hydrometer) from 10 lightships and from 17 coast-stations.

2) 4-hourly observations of the surface current at 10 lightships.

Baltic Area.

Observations of temperature, salinity and oxygen were carried out from the "Biologen" at 2 stations east of Bornholm in July.

At the surface at Christiansø near Bornholm the Danish Meteorological Institute has made daily observations of temperature and salinity (by hydrometer).

All temperature and salinity records mentioned above will be published in the Bulletin Hydrographique

ept those collected by the Danish Meteorological titute, which will appear in the Nautical Meteoro- cal Annual of the Institute.

England.

North Sea and Channel.

(Report by J. R. Lumby).

The surface observations of salinity and temperature re been continued as hitherto, with certain minor erations. The line to Dunkerque runs from Dover tead of Folkestone, and the series across the mouth the English Channel is now fortnightly. Breaks urred in this line and in the Plymouth—Guernsey on account of the ships from which samples were en being changed, owing, unfortunately, in the e of the latter line, to the ship having been lost sea with all hands.

Observations of salinity, temperature, oxygen, and osphates have been made from the "George Bligh" "Onaway" on 11 and 5 cruises respectively, in North Sea, in connection with plankton and plaice- investigations. Hydrographic observations were made from the "George Bligh" on a cruise to land in June/July.

The salinity and oxygen content has been deter- ned at the Government Laboratory and the phos- ate by Mr. Graham, mainly at sea. The data will forwarded to Copenhagen for inclusion in the Bul- n Hydrographique.

(Report by J. N. Carruthers).

During this last year certain changes have been de in connection with the work on currents carried from the Lowestoft Laboratory. The Drift-Indi- or work from the Varne lightship has continued hout a break as during the last ten years, but the rk done with the same instrument from the Cromer oll lightship finished in August, 1936. This was e to the replacement of the wooden lightvessel by steel one. Immediately the change took place, wever, one of the new "Vertical Log" current- ters was installed, and it has been working from Cromer Knoll lightship without interruption ever ce.

n the early part of July, 1936, another of these new truments was installed for continuous work aboard Royal Sovereign lightship off Beachy Head. It has been working without any interruption since installation. The very severe gales of November, 36, did not result in so much as a minute's break in observations at either lightship. December 1st the commencement of a programme of continuous rk with the "Vertical Log" aboard the Galloper and ndettié[1]) lightvessels due to last for twelve weeks — last winter. The latter work is in connection with nkton-collecting, but the current data obtained will make possible the preparation of a second chart of residual currents in the Southern Bight during a whole winter, which should prove useful in further study of the plaice/current question.

The data from the Varne lightvessel have been worked up in the customary form, and the data from the Cromer Knoll and Royal Sovereign lightvessels have been worked up into the form of monthly mean flows.

For all three ships, wind data based on eight observations per day, are available in the form of monthly vector-averages.

Routine drift-bottle work has been further reduced and consists now of a liberation of surface bottles each Monday from the Smith's Knoll lightship only.

Further progress has been made with the working-up of results from experiments over the area of the South-West Dogger Bank Swirl with short-period bottle systems, but the publication of an account of these has been further delayed. It is due to appear in the Knipovich memorial volume now announced for early 1937.

As regards the flow through the Straits of Dover, it is not yet possible to present a value for the whole year, but, judging from the eleven months for which data are available, it is clear that during 1936 there was on the whole a less bold flow from Channel to North Sea than during 1935. During January, July and November (in that order of importance) there was a bold flow towards the North Sea. During March and September the flow was less strong and less easterly. During the months of February, June, August and October, the flow was directed little from north, whilst during April and May, it was directed towards a north-westerly point.

January, June, July, August, and November, were months during which south-westerly winds dominated — very markedly so in January, July, and November. February and March witnessed a predominance of south-easterly winds, April and May were months of strong north-easterly winds, whilst during September and October, north-westerly wind conditions prevailed.

The monthly residual winds worked out for the Cromer Knoll lightvessel, based as in the case of the Varne upon about 240 observations each month, are fully in accord with those for the latter ship.

Finland.

North-Eastern Area.

Onboard the passenger steamer "Lyngen" Professor Buch travelled from Narvik to Spitsbergen and back, Aug. 13th to 26th, and on this voyage samples of the surface water were taken at regular intervals as far north as 80°45′ N.—12°53′ E. within the drifting ice area. Using one of the cabins as a laboratory, determinations of the following elements were made: T, Cl, titration alkalinity, oxygen, pH, and carbonic acid tension. At the same time the atmospheric elements were observed: T, pressure, air-moisture, wind and carbonic acid content, in order to elucidate the car-

[1]) The work on this French lightship is again possible nks to the kind co-operation of the Office Scienti- e et Technique des Pêches Maritimes.

bonic acid balance between sea and air in these arctic parts. These investigations form a sequel to and completion of Prof. Buchs earlier investigation on the same subject on the routes Copenhagen—New York and Copenhagen—Iceland. A desirable but more difficult task would be to reiterate this work during winter, but probably this is only possible on a specially organised expedition.

France.

The French hydrographical work will be briefly reported in the administrative report of the Atlantic Slope Committee and more fully dealt with in the coming Rapport Atlantique.

Germany.

S. North Sea and Baltic.

The regular hydrographical observations from German North Sea lightvessels have been extended in respect of current-observations that since January 1st 1936 have been made every 2 hours instead of at 4-hour intervals. The Baltic lightvessel service was extended to include also the Kiel and the Flensburg lightvessels, from which daily hydrographical series are collected. The 1935-observations have been published.

During two cruises of the R/V "Poseidon" in the Southern North Sea, primarily organized for fishery-biological investigations, hydrographical observations were also made; 1) January 31st to February 22nd, 1936; observers Dr. Kalle and Dr. Goedecke from the Deutsche Seewarte and cand. rer. nat. Lüneburg; 99 station series covering observations on temperature, salinity, oxygen, silicate, nitrogen, and phosphate in addition to observations on colour and light penetration of sea water (cp. Report in the "Annalen der Hydrographie und marit. Meteorol.", March 1936). 2) April 25th to May 4th, 1936; observers Dr. Goedecke and Capt. R. Hatje from the Deutsche Seewarte; 70 hydrographical series on temperature, salinity and oxygen (see "Annalen der Hydrographie und marit. Meteorol.", March 1937).

Holland.

North Sea.

The customary surface observations of temperature and salinity from liners and lightvessels have been continued without change.

During May and June, the "Nautilus" made a cruise towards the Faroës and Iceland on which observations of temperature and salinity were taken by Dr. J. J. Tesch, at the surface and down to depths of 100, sometimes 200 m.

During June and July similar observations were made in the North Sea between 55° and 60° latitude.

During October and November surface samples were collected by the "Nautilus" at 19 fixed stations in the North Sea in accordance with the wish of the Combined North Sea and Eastern Channel Committee.

All samples were titrated at the Fishery Institute at Den Helder, the corrections of temperature for samples from lower layers were applied at De Bilt.

Irish Free State.

Atlantic Slope.

The customary Hydrographic cruises of the S/S "Muirchu", with temperature and salinity observations, took place in March (north coast of Ireland) May (south coast) and August (north coast).

G. P. Farran.

Latvia.

The Fishery Laboratory of the Ministry of Agriculture carried out two hydrographic cruises in the Gulf of Riga and in the Baltic from May 19th to June 5th and from October 10th to November 28th respectively. Samples were collected and measurements carried out at 18 and 16 stations respectively, generally at intervals of 10 m. — at the Gotland Deep at 20 m. intervals. The following determinations were carried out: temperature, salinity, oxygen, hydrogen ion concentration, alkalinity, phosphate and nitrogen compounds. The methods used were the same as in the previous years, as described in the "Bulletin Hydrographique 1934".

The results of the hydrographical cruises were published in the "Bulletin Hydrographique".

By the Hydrobiological Station of the Latvian University (Director: Prof. Dr. Embrik Strand) surface observations of the sea regarding t° and S $^0/_{00}$ were taken regularly, approximately as in 1935. The observations have been or will be published in the "Bulletin Hydrographique" and in the "Folia Zoologica et Hydrobiologica" Vol. IX, N. 1, p. 84. (1936) (continuation in the following number).

The Marine Department of the Ministry of Finance continued water-level observations at 11 stations along the Latvian coasts. The results of the observations are sent to the Hydrographical Service of the Council and partly published in the "Bulletin Hydrographique".

Measurements of sea-current direction and velocity were continued by the Department as in former years from the lightship at Oviži.

Hydrographical measurements were continued in the Baltic from Kolkasrags to Oviži, and in the Gulf of Riga from Kolkasrags to Enguri. A new chart: Roja-Mērsrags, (I:50,000) has been published by the Department. The Marine Department has issued the following publication: "Water stage, sea-current and sediment movement observations at the coast of Latvia 1929—1933. — Assembled and interpreted by Peteris Stakle."

Norway.

North Eastern Area.

On all cruises temperature and salinity was determined at standard depths (0, 10, 25, 50, 75, 100, 125,

0, 200, 250, 300, 400, 500, 600, 700, 800 and 1000 m.) equently also at other depths; at a great number stations also oxygen, pH and phosphate were termined at all depths from which water samples ere taken, totalling 4,942 temperature and salinity, 054 oxygen, 1,511 pH and 1,404 phosphate deter-inations.

The regular fortnightly observations at four fixed ations were continued uninterruptedly. These four sitions are: 1) Sognesjøen, outside the threshold the Sognefjord, 2) at Skråva in the Vest Fjord, . of the Lofoten Islands), 3) at Eggum, on the west le of Lofoten and 4) at Ingøy in West Finmark, at well over 300 m. except at Eggum where the servations are taken at about 200 m., in each case the usual standard depths.

Of the six thermograph lines run by the Directorate, ly one falls within the North-Eastern Area, namely e fortnightly line Bergen—Kirkenes (E. Finmark). paper on the results obtained on this line by r. Eggvin is to appear shortly.

Poland.

altic Area.

Two institutions in Poland have been occupied ith oceanographical work during 1936: the Marine ation at Hel and the Marine Department of the ate Meteorological Institute at Gdynia.

The Marine Station at Hel has employed the fishery research cutter "Ewa" for monthly hydrographic observations (salinity, temperature, oxygen, phosphate, nitrate and pH) at 12 selected places in the Gulf of Danzig.

By the State Meteorological Institute regular hydrographical observations have been carried out as follows:

(a) Daily observations of temperature and salinity at 3 coast-stations.
(b) Surface temperature and salinity made from liners between Gdynia-Kiel, Gdynia-Malmö, twice monthly, and between Gdynia-Stockholm and Gdynia-Gäfle, three times monthly.
(c) Current-observations by means of surface drift-bottles liberated from the steamers mentioned above (b). Out of 662 bottles liberated 268 have been recovered.
(d) Registration of the sea level at 1 station and reading of the sea level at 2 stations.

Hydrographical data (surface salinity and temrature) collected during the round-the-world cruise the training ship "Dar Pomorza" in 1935 have en published in the Memorial of the State Meteorogical Institute No. 7.

Portugal.

tlantic Slope.

On behalf of the "Station de Biologie Maritime de isbonne" the S/S "Albacora" has been commissioned during 1936, a. o. work to make hydrographical observations off the coasts of Portugal. All material has been sent to the Service Hydrographique and will be published in the "Bulletin Hydrographique pour l'année 1936".

Scotland.

N. North Sea.

In the liberation of surface drift-bottles and the collection of temperature and salinity data in respect of surface, intermediate and bottom waters, the research vessel "Explorer" during 1936 covered the following areas:—

February:	The Firth of Forth offing.
March:	Coastal regions from Aberdeen to Stornoway, including Orkney and Shetland.
April:	The north-western area of the North Sea and the region between Shetland and Norway.
May:	Mainly coastal regions from Aberdeen to Stornoway and the middle North Sea area.
June:	The Wyville-Thomson Ridge, Faroe-Shetland Channel, Faroe region and the north-western North Sea.
July:	Outer and inner regions off the west coast of Scotland, including the Firth of Clyde; the north-western North Sea.
August:	The north-western North Sea.
September:	The middle North Sea area.
October:	The Moray Firth and from the Firth of Forth to the south-west Dogger Bank.
November:	Moray Firth and Orkney waters, also the Firth of Forth.
December:	The Moray Firth.

A preliminary survey of the data affords the following general conception of hydrographic conditions throughout the year.

1936 would not appear to have been marked by any outstanding physical phenomenon as was 1935, when certain effects of abnormal activity in polar waters were evident in the hydrographical conditions of the Northern North Sea and Faroe-Shetland Channel in that year. Nevertheless, 1936 cannot be described as a "normal" year. On the whole and with reference to the chief hydrographic feature of the above regions, namely, the Atlantic water influence, the year evidently takes its place in what would appear to constitute a long-period cycle of events embracing, so far, the previous six years. Commencing 1930 there seems to have been a yearly accession to the intensity of this oceanic influence in the Northern North Sea, which reached its climax in 1934 and which has since gradually declined. So that, while there evidently was less Atlantic water in the Northern North Sea during 1936 than during 1935, the year, for the most part, was still "above normal". This, however, did not begin to be evident until the month of July.

In March, although practically all observations were

taken in proximately coastal waters, there was indication in the temperatures and salinities of the Shetland area that the usual spring acceleration of the Atlantic water current in the Faroe-Shetland Channel was taking place. The inference, however, was not sustained by the following month's data from the Shetland to Norway region, nor by the observations of May in the middle North Sea. Temperatures in the former region were at least 1° C. below those generally found at the time of the year. The anomaly was less in the middle area in May but definitely negative.

In June there was less Atlantic water on the Wyville-Thomson Ridge than on the same section almost exactly a year before and the salinities of 1936 nowhere reached the 35·50 $^0/_{00}$'s of 1935, indicating a less intensive oceanic pulsation towards the Ridge in the former year. A corresponding difference was evident as between the Faroe-Shetland sections of the two years.

The highest positive anomaly in Northern North Sea conditions in 1936 occurred during the latter half of July and throughout August, when surface temperatures were from 1·5° to 2° C. above "normal". This suggests that maximum intensity of the Atlantic inflow, which generally takes place in April, was considerably later in its incidence in 1936, which probably explains why normal "summer" conditions were still encountered in the open-waters of the middle area at the end of September and into October and why positive temperature anomaly in the north-western part of the North Sea was still in evidence up to the middle of December.

John B. Tait.

Sweden.

Baltic and Transition Areas.

No report received.

PLANKTON COMMITTEE

1936.

Prof. H. H. Gran.

Belgium.

No special report received.

Denmark.

The work carried out in 1936 by the Plankton Laboratory of "Kommissionen for Danmarks Fiskeri- og Havundersøgelser" may be recorded as follows.

I. Home waters.

1. Dr. P. Jespersen has finished the investigation of the herring food in the Bornholm waters begun in 1932, and published a paper on his results (1).

2. The working up of the material of the investigation 1932—1933 concerning the plankton production in the Sound has been finished and a report by Dr. E. Steemann Nielsen is in press (2).

3. The collection of water samples for quantitative plankton determinations on the routes: Oslo—Copenhagen, Odense—Copenhagen, and Rønne (Bornholm) —Copenhagen has been continued. The material has partly been worked up by Dr. E. Steemann Nielsen. The object of the programme is to investigate the development of the production of phytoplankton in Danish waters at different seasons. It has been established that in the Kattegat a rather considerable production of phytoplankton takes place generally during the winter months. The proper "spring maximum" sets in about the 1st of February.

4. Weekly collections of plankton from three lightships in Danish waters have been continued,

II. Northern waters.

1. Dr. P. Jespersen has continued and finished his investigations on the copepod-fauna of East-Greenland waters, and is preparing a paper on this subject.

2. Dr. Jespersen is likewise preparing a report on size variations of copepods in West-Greenland waters (in press).

3. Dr. P. Jespersen has continued the examination of macroplankton collections from Iceland-waters, Prof. Ove Paulsen those of microplankton, both with biological and geographical aim.

4. From the mail-steamers Copenhagen—Reykjavik water samples for quantitative plankton determinations have been collected during the months April—June between the Faroes and Iceland and on the coast of Iceland. The aim of these investigations is to determine the time for the beginning of phytoplankton production in the different years.

5. The working up of the material from the cruise of M/C "Thor" to the west and south of Iceland in 1935 has been continued. A report on light and CO_2-assimilation will soon appear.

III. Publications.

1. Jespersen, P., "The food of the herring in the waters round Bornholm". Medd. Komm. Danmarks Fiskeri- og Havundersøgelser. Serie Plankton, Vol. III Nr. 2. 1936.
2. Steemann-Nielsen, E., "The annual amount of organic matter produced by the Phytoplankton in the Sound off Helsingør. *Ibidem.* Vol. III Nr. 3. 1937.

England.

Lowestoft.

Seven plankton cruises of the research steamer "George Bligh" and eight short cruises of the motor drifter "Onaway" were made during 1936 as follows:—

1. Investigations on the ether-solublc matter of dried plankton (a) along the English east-coast area (June and October) (b) monthly observations at six stations between Flamborough Head and the south-west patch of the Dogger Bank (January to November).

2. Plankton of the northern grounds. Three parallel lines of stations across the North Sea, the northernmost line crossing from off the Northumberland coast to off the Naze (May).

3. Investigations into the relation between abundance of plankton and hydrological conditions (May, August and September).

4. The relation between phytoplankton concentrations and the autumn shoaling of herring off East Anglia (October and November).

Observations along the monthly Hensen-net stations of the Flamborough Line and on two cruises, one in June and the other in October, were continued this year, the area covered being the same as in former years. The distribution of the fat values for dried

plankton showed similar trends in time and place to those shown each year since the Flamborough-Line series was started.

Both for the Flamborough Line and for the June and October cruises the fat values were lower than in any of the years yet recorded.

Arbitrary measurements of the red-yellow pigments in the Hensen catch were made each month at the Flamborough-Line stations by comparing acetone suspensions of the plankton with potassium bi-chromate standards. It was found that the pigment reached a maximum in July and that it did not vary directly with the fat content.

Attention has also been given to the feeding and breeding of plankton animals and their relation to phytoplankton concentrations. For the Flamborough-Line series of observations there has emerged a good correspondence between the number of ova and the amount of phytoplankton present.

Work has been continued with the Lowestoft photometer, which has proved satisfactory and practical for the determination of phosphate at sea. A considerable body of data is now available bearing on the relation of nutrient salts to phytoplankton production and a report on the observations from 1934—1936 is in preparation.

The usual autumn survey of the phytoplankton concentrations in the Southern North Sea was carried out from the end of September to the end of November. *Rhizosolenia styliformis* was very scanty. *Biddulphia sinensis*, however, was present in much greater abundance than in 1935. A dense patch was found in the Thames Estuary at the end of September and a lighter patch in the neighbourhood of Tea Kettle Hole (ca. 53°30′ N. Lat. and 3° to 4° E. Long.). In early October the Thames concentration had apparently spread north-east and diminished in density, while the more northern patch had spread south-west and increased in density twentyfold. At the end of October the southern patch had disappeared while the northern one had drifted some 40 or 50 miles north-eastward and increased greatly in extent; two weeks later this patch had drifted a further 70 or 80 miles to the north-east.

The phytoplankton concentrations were never in a position where they would be likely to interfere with the shoaling of the herring; when they were nearest to the fishing ground — in early October — some of the best landings of herring came from near the western edges of the patches.

Publications.

1. Savage, R. E. and Wimpenny, R. S. "Phytoplankton and the Herring. Part II. 1933 and 1934". Min. of Agric. and Fish. Fish. Invest. Ser. II, Vol. XV, No. 1, London, 1936.
2. Wimpenny, R. S. "The size of Diatoms. I. The diameter variation of *Rhizosolenia styliformis* Brightw. and *R. alata* Brightw. in particuliar and of pelagic marine diatoms in general". Journ. Mar. Biol. Assoc., N. S., Vol. XXI, No. 1, Plymouth, 1936.

Plymouth.

At the Plymouth Laboratory of the Marine Biological Association several workers have been engaged upon plankton investigation, Dr. M. V. Lebour in studying lamellibranch larvae, Mr. F. S. Russell upon a monograph on British Medusae and also in following the changes in distribution of the *Sagitta elegans* community of oceanic plankton and the *S. setosa* community of coastal plankton in the English Channel. Mr. H. W. Harvey has investigated the growth rate of *Biddulphia mobiliensis* under known conditions of temperature and illumination, and, in collaboration with Dr. L. H. N. Cooper, the nature, and availability to diatoms of iron in sea water.

Dr. Gross kept a number of centric plankton diatoms in pure cultures, using Foyn's "Erdschreiber" as culture medium. Resting-spores occurred regularly in culture of *Ditylium Brightwelli* during autumn, winter and early spring. The interaction of 3 factors was found to be responsible for their formation: 1) crowding, 2) low temperature, 3) low light intensity. In all species cultured a continuous decrease of the average cell-diameter could be observed. Formation of auxospores only took place when the diameter had decreased to a certain size. After that they occurred in great numbers in overcrowded cultures.

Hull.

The University College of Hull have continued their plankton survey of the Southern North Sea by means of continuous plankton recorders, and during 1936 have made monthly traverses on the lines Hull to the Skagerak, Hull to Bremerhaven, and Hull to Rotterdam and also during the spring and autumn an experimental line has been run between the Sunk and the Horns Reef lightships. During the autumn herring season weekly traverses were made on the Hull to Bremerhaven line.

France.

Par le Prof. L. Fage.

M. Francis Bernard poursuit ses recherches sur les variations saisonnières de la densité du microplancton et du nannoplancton, avec dosage des sels nutritifs. Une année entière de dosages sera terminée à Monaco en Mars 1937, et jusqu'à présent les résultats obtenus pendant les premiers mois de 1936 ont seuls fait l'objet d'une publication[1]).

Parallèlement, une autre station méditerranéenne, Banyuls sur mer, est étudiée dans les mêmes conditions et se montre notablement différente de Monaco. Il convient de comparer les valeurs obtenues à celles de l'Atlantique: dans ce but le navire "Président Théodore Tissier" a effectué une série de prises d'eau en Avril—Juin 1936 depuis le Golfe de Gascogne jusqu'aux Açores et aux côtes du Sénégal. Ces échantillons, en cours d'examen, permettront d'apprécier la

[1]) Fr. Bernard et L. Fage: "Recherches quantitatives sur le plancton méditerranéen". Bull. Inst. Océanogr. 1936, 701.

chesse relative des eaux méditerranéennes en petits agellés, groupe dominant dans les zones explorées.

Le Navire de Recherches "Président Théodore issier" a en effet effectué 60 opérations planctoniques n cours de sa sixième croisière.

Les engins employés ont été les filets Schmidt de m. de diamètre, isolés ou en série, de la surface à 000 mètres de profondeur, et le filet pélagique verti- al à ouverture carrée de 2 m. de côté, qui est descendu squ'à 2400 mètres. Les régions explorées ont été sud de la Bretagne entre Penmarch et Belle Ile, le ilieu du Golfe de Gascogne, les parages des Açores, Banc Kalusoff, la Fosse de Monaco, les parages Arguin, la région comprise entre le Cap et les Iles u Cap Verd, les parages de la Guinée et du Sénégal, les Iles Canaries.

Un matériel important et très varié a été conservé et st actuellement à l'étude, notamment les méduses par Dr. G. Ranson, les crustacés par le Prof. L. Fage, s mollusques (ptéropodes, hétéropodes et céphalo- odes) par M. P. Desbrosses, les poissons et les uniciers pélagiques par M. G. Belloc, et les larves t œufs de poissons par M. J. le Gall.

Le mauvais temps a fortement géné les opérations lanctoniques pendant la septième croisière: Mer du Nord, Ecosse, Mer d'Irlande et Entrée occidentale de a Manche.

Germany.

After a discussion with various experts the Sub-ommittee for ensuring the correct determination of plankton species has elaborated a list of northern microplankton species which should assist in avoiding ncorrect determinations (see Rapp. et Proc.-Verb. ol. 100, III, App. 4, p. 15). The Sub-committee as thus finished its task. (E. Hentschel.)

(English summaries of the following reports are iven in the Reports of the Southern North Sea and he North-Western Area Committees.)

Hamburg.

Die Hydrobiologische Abteilung des Zoologischen Instituts setzte die Untersuchungen im Bereich der Northwestern Area fort (s. Bericht für die NW. Area). Auf zwei Fahrten zwischen den Orkneyinseln und den Vestmannainseln, sowie längs der Westküste und der westlichen Nordküste Islands wurden Plankton-proben in Abständen von gewöhnlich $12^1/_2$ oder $6^1/_4$ Sm. genommen, ebenso auf einer Fahrt von 6[illegible] Sm. senkrecht zur Nordküste Islands Proben in Abständen von 5 Sm., sowie zerstreute Proben aus dem nordisländischen Heringsfanggebiet, schliesslich tägliche Proben aus dem Siglufjord. Es handelt sich durchweg um Oberflächenproben von 5 Litern, aus denen mit Hilfe von Sieben aus feinster Phosphor-bronzegaze das Microplankton gewonnen wurde. In Siglufjördur wurden einen Monat hindurch Magen-inhalte von Heringen von zahlreichen Fangplätzen längs der ganzen Nordküste untersucht mit dem Zweck, das Plankton des Gebietes kennen zu lernen, auch das Nannoplankton, das von *Calanus finmarchicus* gefressen wird. Nannoplanktonbestimmungen nach einer neuen Methode wurden im Siglufjord ausgeführt. Alle diese Untersuchungen sollten zur Abrundung des isländischen Beobachtungsmaterials insbesondere im Norden der Insel dienen.

In der Ostsee wurden monatliche Untersuchungen von Oberflächenproben von 1 Liter nach derselben Methode wie bei Island an 5 (zuletzt 6) Küstenstationen zwischen Fehmarnbelt und Kolberg in Angriff genommen zum Zweck quantitativer Kennzeichnung der Planktonveränderung auf dieser Strecke im Kreislauf des Jahres.

Für das Jahr 1937 ist Fortsetzung der Untersuchungen bei Island und in der Ostsee in Aussicht genommen.

Helgoland.

Auf den Fahrten des "Poseidon" (1.—21. Februar und 26. April—3. Mai) wurde an zahlreichen Stationen, die in einem möglichst dichten Netz über das Untersuchungsgebiet verteilt wurden, das Kleinplankton der Oberfläche in üblicher Weise gleich nach dem Fang lebend untersucht. Auf engste Zusammenarbeit mit den hydrographischen Untersuchungen wurde dabei grösster Wert gelegt. Besonders die Februarfahrt ergab ein klares Bild über die für den Winterzustand charakteristische Verteilung des Oberflächenplanktons. Auf der Aprilfahrt wurden die Untersuchungen durch das massenhafte Auftreten von *Phaeocystis* beeinträchtigt, da durch sie die Filtrationsfähigkeit der Netze stark herabgesetzt war. Es wurden nicht nur für die Oberfläche sondern auch für tiefere Schichten Zählungen der *Phaeocystis*-Kolonien ausgeführt.

Ferner wurden von den Teilnehmern der Fahrten der Fischereischutzboote "Weser" (30. Sept.—22. Okt.) und "Elbe" (12. Nov.—14. Dez.) Oberflächenplanktonproben heimgebracht, die in der Biologischen Anstalt untersucht werden sollen.

Die regelmässigen täglichen Untersuchungen des Planktons von der Reede von Helgoland wurden fortgesetzt. Bei der in Aussicht genommenen zusammenfassenden Verarbeitung dieser Beobachtungen soll besonders der Einfluss des Elbwassers auf das Plankton bei Helgoland untersucht werden. Um eine allgemeine Grundlage dafür zu gewinnen, wird z. Z. das gesamte lückenlose hydrographische Material von der Reede von Helgoland (1903—1913 und 1918—1936) bearbeitet. Dieses wird zunächst gesondert veröffentlicht werden, ebenso eine Zusammenstellung über das jahreszeitliche Vorkommen der Organismen des Grossplanktons, die nach den Beobachtungen des Oberpräparators der Anstalt, J. Hinrichs, (besonders für die Jahre 1929—1933) gemacht wurden.

Auf der Fahrt des "Poseidon" 1.—21. Februar wurde die Verbreitung des Grossplanktons im Gebiet Deutsche Bucht — Doggerbank — Nordostrand der Hoofden sehr gründlich untersucht. Die Ergebnisse brachten im wesentlichen eine Bestätigung der Erwartungen. Leitformen des Kanalwassers wur-

den bis zu den nordöstlichen Stationen auf der Höhe von Röm gefunden. Die flämische Küstenform *Clytia pelagica*, deren Verbreitung in der südöstlichen Nordsee keine grundsätzlichen Unterschiede gegenüber derjenigen der Kanalformen aufweist, war bis Amrum nachzuweisen. Nördliche Formen kamen im Nordwesten des Untersuchungsgebietes unvermischt vor, weiter nach Südosten zu waren sie aber in weiten Gebieten mit den vorgenannten Leitformen vergesellschaftet. Eine Leitform des deutschen Küstenwassers (*Sarsia tubulosa*) fand sich vor der Küste der Deutschen Bucht.

Während der Fahrt des "Poseidon" 26. April—3. Mai von der Deutschen Bucht bis nach den mittleren Hoofden konnte dem Grossplankton keine grosse Aufmerksamkeit gewidmet werden, da eine andere Arbeit im Vordergrunde stand. Das Grossplankton zeigte die der Jahreszeit entsprechenden Verhältnisse, es wurde im wesentlichen von Coelenteraten und Crustaceenlarven beherrscht.

Die Untersuchungen auf der Reise des Fischereischutzbootes "Elbe" 11. November—13. Dezember in die südwestliche Nordsee und den Kanaleingang erbrachten ebenfalls keine Tatsachen, die von den auf den entsprechenden Fahrten der vorhergehenden Jahre gewonnenen Beobachtungen abwichen.

Über die Verbreitung der Leitformen des Grossplanktons in der südlichen Nordsee im Winter wurde eine Veröffentlichung vorbereitet, welche die auf den diesbezüglichen Fahrten der letzten Jahre (November 1928—Februar 1936) gemachten Beobachtungen berücksichtigt. Damit werden diese Arbeiten zu einem gewissen Abschluss gebracht, und es erscheint jetzt wünschenswert, die Untersuchungen auf andere Jahreszeiten und andere Gebiete auszudehnen.

Auf der Poseidonfahrt vom 26. April bis zum 3. Mai 1936 wurden von Dr. Werner Beobachtungen an Muschellarven aus dem Plankton angestellt. Ein Teil der Larven wurde auf Helgoland bis zum Bodenstadium weitergezüchtet, sodass die Art sicher bestimmt werden konnte. Die meisten Larven kamen in Küstennähe vor, dort fanden sich auch einige jüngere Stadien. Nachgewiesen wurden folgende Arten: *Mytilus edulis*, *Mya arenaria*, *Zirphaea crispata*, *Saxicava rugosa* forma *arctica*, *Macoma baltica*. Die 3 letztgenannten Arten wurden nur vereinzelt beobachtet. Ein kurzer Bericht über die Muschellarven soll veröffentlicht werden.

Holland.

No report received.

Irish Free State.

Routine collections of macroplankton samples by vertical hauls were made during the hydrographic cruises on the north coast of Ireland in March and August 1936 and on the south coast in May 1936.

A report by Miss W. E. Frost on the larval development of the Euphausian *Thysanopoda* will be published shortly.

Latvia.

No report received.

Norway.

The phytoplankton material from the Oslofjord, collected during 1933—34 by the staff of the Biological Laboratory in connection with the investigations of *Pandalus borealis* has been worked up by Dr. Trygve Braarud and Mag. Adam Bursa (Poland), and is ready for publication. — The work on the phytoplankton of the inner part of the Oslofjord, as influenced by sewage from the city of Oslo, has been continued by Dr. Braarud who likewise continues his work on the cultures of phytoplankton.

Mrs. Karen Gaarder is continuing the work with the collections of phytoplankton from the "Michael Sars" Expedition 1910.

As to reports on the work at the Institution of the Director of Fisheries, Bergen, see the North Eastern Area Committee Report.

Poland.

Investigations on the phytoplankton production in the Gulf of Danzig have been started by Mr. Bursa. The work consists of a collection of plankton samples for qualitative and quantitative research in connection with hydrographical data (T, S, O_2, P, N, pH).

Mr. Mańkowski has undertaken the investigation of the seasonal distribution of the zooplankton in connection with the problem of the sprat food.

A report by M. Ramułt on "Cladocera of the Bay of Puck" has been published in the "Bulletin de la Station Maritime de Hel." —

Portugal.

No report received.

Scotland.

See Northern North Sea Committee Report.

Spain.

No report received.

Sweden.

Investigations into the diurnal changes in the vertical distribution of macroplankton, especially of the herring fry, have been made during the late autumn of 1936.

The monthly investigations of the plankton within the Bohuslän skerries have been continued.

Note.

The Attention is drawn also to the various Area Reports in which further details are given for some countries.

SALMON AND TROUT COMMITTEE

1936.

Prof. M. Siedlecki.

The total results of the fishery for salmon and sea trout were very different in the several countries. Holland announced a considerably better result than that of last year; Denmark, Finland, the Free Port of Danzig and Scotland reported a slight increase only; in Poland there was a slight decrease, but in Latvia and the Irish Free State a considerable decrease in the yield of salmon fishery was stated. It seems that the variability of results is due to local causes and not to an influence of factors working upon large areas.

The actions of hatcheries in different countries also varied according to local conditions. A comparison between the yield of the salmon and sea-trout fishery and the number of fry and parrs liberated in the rivers of the respective countries demonstrates clearly the different degrees of the significance of artificial propagation. It seems that in many countries the artificial propagation cannot be regarded as a very important factor in improving the stock of salmon.

Denmark.

1. Biological Investigations.

The following marking experiments with salmon have been undertaken: 236 2-year-old salmon were marked and liberated in Kongeaaen (SW. Jutland) on April the 18th; 3500 half-yearlings were marked (by burning away the fat fin) and liberated in Storeaaen (W. Jutland).

The collection of statistics as to length and weight of sea trout caught in the river Gudenaa and Randers Fjord has been continued. Scales of salmon and sea trout have been collected from various fresh waters as well as from the sea.

Investigations in water courses as to the amount of food available, and conditions in general for fry in order to determine the optimal amount of fry to be liberated have been continued.

2. Statistics for the year 1935. (from Fiskeri-Beretning 1935, Danish Board of Fishery):

Catch in	Salmon kg.	Trout kg.
North Sea and Skagerak incl. the Fjords	7,633	4,207
Limfjord	1,585	72,276
Kattegat and the Sound	15,376	23,445
Belt Sea	5,830	13,513
Baltic	65,641	5,905
Total...	96,065	119,346

Generally speaking the catches in 1935 have been slightly improved as compared to 1934.

Estimation of the yield of the salmon and sea trout fisheries in 1936.

The catch of sea trout seems to have been slightly larger in 1936 than in the previous year. The salmon fishery round Bornholm was very poor during the first six months of the year. During the last months, however, the catches have been fairly satisfying.

3. Artificial Propagation.

Output of fry (in thousands) of sea trout in water courses leading to the	fry	half-yearlings
North Sea	740	55
Limfjord	770	32
Kattegat	868	297
Belt Sea	615	15
Western Baltic	82	..
Baltic proper	966	..
Total...	4,041	399

The output has been somewhat higher than in 1934. 10,000 tiny and 100 half-yearlings of salmon have been liberated in Kongeaaen (W. Jutland). 6·4 mill. fry of *Coregonus lavaretus* were liberated in water courses leading to the North Sea.

England.[1])

1. Report on work on Salmon and Sea Trout.

The general lines of research described in the previous report have been continued. The results of the further work done on the examination of fish stomachs confirm the conclusions already arrived at.

The experiments on feeding brown trout on *Gammarus* described in the last two reports were concluded in November. By that time data for two years had been collected which are now being subjected to statistical examination. The general conclusions suggested in last year's report appear to be confirmed by the completed data. They may be briefly recapitulated thus: more food is required to maintain the body weight in summer than in winter, and the amount of food a fish will eat, and the growth it makes, is greater in warm weather than in cold weather. It is hoped shortly to publish a full description of the details and results of the experiment.

[1]) Extract of "Salmon and Freshwater Fisheries — Report for the Year 1935".

In September an experiment was begun to test the effect on the growth of trout of water artificially softened by the zeolite process. Two tanks were set up, one supplied with Itchen water and the other with softened Itchen water. The same number of trout, of about the same size, were placed in each tank and fed daily. For reasons which need not be detailed here the food chosen was raw beef liver. It was found, however, that, although the trout in the unsoftened water remained healthy, those in the softened water died after about a week. The symptoms preceding the death of the fish were the same in all cases and it appeared therefore that trout would not live in softened water, although it was possible that the sudden change from hard to soft water might be responsible. For a time therefore the tank was supplied with a mixture of softened and hard water, the amount of hard water being gradually reduced. Even then, although the fish remained healthy so long as even a small quantity of hard water was supplied, they died when eventually the tank received only softened water. It appears therefore that trout will not live on a diet of liver in completely softened water but it has been found that very little hard water mixed with the softened water (about one-thirtieth of the total quantity supplied) is sufficient to keep the fish alive and healthy and the experiment is now running satisfactorily.

2. Statistics of Catch.

1. The total quantity, as returned, of salmon and migratory trout secured in 1935 amounted to 10,537 cwt. by weight and 113,814 in number (vide Table I), about 21·5 % in number and 22·7 % by weight being accounted for by rod and line. Of this quantity migratory trout comprised 6·4 % by weight and 22·4 % in number.

2. Generally speaking the results in the Districts as a whole can be regarded as reasonably good. Rain and adequate spates in the first part of the season enabled a number of rivers to be stocked with the early run of salmon and a wet spell in June helped those rivers which depend on the summer fish. The subsequent drought until September was favourable neither to the rods nor the nets.

Grilse, which were noticeably plentiful in a number of Districts during 1933 and 1934, were not so plentiful in 1935. The large class of spring fish and the smaller summer fish appear to have been more plentiful.

Migratory trout seem to have been relatively scarce in most Districts, more especially in the non-tidal waters, owing no doubt to the drought in July and August.

In most Districts the spawning season was considered satisfactory. A succession of opportune spates beginning early in the autumn took the fish to the higher waters and ensured an even distribution. Most of the spawning was completed when the rivers were still swollen and discoloured. Estimates of the amount of spawning done must therefore necessarily have been further from approximation to accuracy than usual.

From two or three districts smolts are reported as having been numerous. It is to be supposed, however, that the bulk of the migration must have occurred, in the western and southern rivers at all events, during the period of relatively full waters in the latter half of April, and that consequently the opportunities for observation were not very favourable. In the Tyne and the Tees the usual mortality seems to have overtaken the shoals during their passage through the polluted tidal reaches.

The season as regards brown trout appears to have been only moderately good. The cold spell in the latter half of May and the subsequent drought from mid-June onwards were not conducive to good results.

Finland.

1. Biological Investigations.

During 1936 material for scale-analyses of salmon was collected in Tornio, Kemi, Oulu, Kokemäki rivers and in the Kemi estuary. Marking of some young salmon was carried out in Kymi river.

Table I. Catches of Salmon and Migratory Trout as returned by the Fishery Boards of certain Fishery Districts for 1935 (Weight in lb.).

	Salmon		Migratory Trout		Total Salmon and Migratory Trout. All Instruments	
	No.	lb.	No.	lb.	No.	lb.
Rods	17,290	258,018	7,153	10,036	—	—
Nets	71,083	846,661	18,288	65,426	—	—
Total...	88,373	1,104,679	25,441	75,462	113,814	1,180,141

The returns in this table are in respect of 27 Fishery Districts, as against 25 in 1934, when a catch of 108,336 fish weighing 9,333 cwt. was reported.

2. Statistics.

The yield of last summer (1935) was slightly better than that of the summer 1934.

3. Artificial Propagation.

Tiny fry of salmon was liberated: in Tornio river 300,000, in Kemi river 644,800, in Oulu river 480,000, in Kokemäki river 96,600 and in Kymi river 156,300; the total number of salmon fry distributed was 1,677,700.

Summer-old parrs were liberated: in Kemi river 16,420 individuals, in Kokemäki river 50,000, in Kymi river 9,990; the total number of distributed parrs was 76,410 individuals.

Eggs of Chinook-salmon, sent from Oregon, were tched privately; tiny fry was liberated in Oulu river 8,760 ind.), and in Kokemäki river (800 ind.); in tumn, parrs were liberated in Oulu river (11,910 d.), in Kokemäki river (incl. Kulovesi, 23,435 ind.), d in the small rivers Karvia and Noormarkku ,000 ind.). Two-year old parrs were marked (125 d.) and liberated in the Kymi river in May.

France.

No report received.

Germany.

ntersuchungen über Salmoniden in Deutschland im Jahre 1936.

Von dem Deutschen Seefischereiverein sind ährend des Jahres 1936 Aussetzungen von Salmonien in die Ostsee im Verfolg der im Jahre 1935 egonnenen Arbeiten getätigt worden. Es sind in e Wismarsche Bucht Bachforellenbrut, ein- und veisömmerige Bachforellen, sowie erstmalig auch egenbogenforellen ausgesetzt worden. Soweit es die änge der Fische zuliess wurden diese markiert. Die isherigen Wiederfänge haben ergeben, dass beide orellenarten ein aussergewöhnlich starkes Wachstum der Ostsee zeigen.

Die Seefischereistation Neukuhren des ischerei-Institutes der Universität Königserg hat gleichfalls die seit mehreren Jahren vorenommenen Aussetzungen von Salmoniden an der amlandküste fortgesetzt. Es wurden zwei- und einömmerige Bachforellen, zweisömmerige Meerforellen owie aus lettischen Lachseiern aufgezogene zwei- und einsömmerige Lachse ausgesetzt. Sämtliche Fische wurden markiert.

Die bisher seit 1928 regelmässig vorgenommenen Bestandsanalysen an Lachsen der Samlandküste sind von Neukuhren aus weiterhin durchgeführt worden. Bisher sind folgende Grenzwerte für Länge und Gewicht der Treibnetz- und Angellachse in den einzelnen Jahren festgestellt worden (3835 Stück Lachse):

	Max. Länge	Max. Gewicht	Min. Länge	Min. Gewicht
1928/29.....	122	21	71	3
	bezw. 125	18		
1929/30.....	135	25	70	2·5
1930/31.....	121	21·5	71	4
			bezw. 72	3·7
1931/32.....	122	21	63	2·3
1932/33.....	131	18·3	63	2
1933/34.....	118	22	66	2·3
	bezw. 120	21		
1934/35.....	122	26·2	63	1·7
1935/36.....	125	23	64	1·9
1936/37.....	118	21·5	61	1·8
	bezw. 121	19·5		

Nicht in dieser Tabelle enthalten sind die vereinzelt auftretenden Junglachse (Speitzken), die eine Länge von etwa 50 cm. und ein Gewicht von 0·5 kg. haben. Die kleinsten Lachse der Tabelle sind sämtlich im zweiten Seejahr gefangen worden.

Für die einzelnen Altersgruppen ergeben sich in den letzten 5 Jahren folgende Längen- und Gewichtsgrenzen:

Süssw.	Seew.	Ges.	1932/33		1933/34		1934/35		1935/36		1936/37	
			Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
2	2	4	90 cm.	69 cm.	91 cm.	68 cm.	..	..	96 cm.	74 cm.	88 cm.	72 cm.
			8 kg.	2·3 kg.	7·9 kg.	2·2 kg.	..	..	7·2 kg.	3·7 kg.	7·4 kg.	2·7 kg.
2	3	5	115 cm.	87 cm.	109 cm.	75 cm.	108 cm.	94 cm.	107 cm.	86 cm.	107 cm.	86 cm.
			16·5 kg.	7 kg.	14·4 kg.	3·8 kg.	13·2 kg.	8 kg.	12·6 kg.	5·5 kg.	14 kg.	6.6 kg.
2	4	6	115 cm.	110 cm.	120 cm.	98 cm.	106 cm.	97 cm.	125 cm.	94 cm.	..	..
			18 kg.	16 kg.	23 kg.	10 kg.	14·2 kg.	9·5 kg.	16·4 kg.	8 kg.	..	..
2	5	7	..	..	..	..	..	..	115 cm.	105 cm.	..	..
			..	..	..	..	..	..	18·5 kg.	11·2 kg.	..	..
3	2	5	92 cm.	63 cm.	99 cm.	66 cm.	97 cm.	63 cm.	97 cm.	64 cm.	112 cm.	90 cm.
			7 kg.	2 kg.	7·9 kg.	2·3 kg.	8·8 kg.	1·7 kg.	9·5 kg.	1·9 kg.	12·2 kg.	6·6 kg.
3	3	6	110 cm.	87 cm.	109 cm.	88 cm.	105 cm.	73 cm.	124 cm.	85 cm.	112 cm.	92 cm.
			15 kg.	6 kg.	15·1 kg.	5·2 kg.	13 kg.	3·4 kg.	16·5 kg.	5·8 kg.	17·2 kg.	7·5 kg.
3	4	7	119 cm.	104 cm.	119 cm.	87 cm.	122 cm.	97 cm.	121 cm.	90 cm.	121 cm.	105 cm.
			20·5 kg.	11·1 kg.	20 kg.	5·8 kg.	26·2 kg.	9·1 kg.	18·5 kg.	8 kg.	20·5 kg.	11·2 kg.
3	5	8	..	..	..	..	..	..	120 cm.	111 cm.	115 cm.	100 cm.
			..	..	..	..	..	..	21·5 kg.	17 kg.	15·2 kg.	7·8 kg.
4	2	6	..	..	96 cm.	69 cm.	91 cm.	73 cm.	99 cm.	80 cm.	99 cm.	61 cm.
			..	..	10·5 kg.	2·7 kg.	7·4 kg.	3·3 kg.	10 kg.	5 kg.	10·8 kg.	1·9 kg.
4	3	7	..	..	104 cm.	81 cm.	105 cm.	82 cm.	109 cm.	85 cm.	103 cm.	101 cm.
			..	..	12·3 kg.	5·3 kg.	12·5 kg.	4·5 kg.	14 kg.	6·2 kg.	11·9 kg.	10·2 kg.
4	4	8	..	..	110 cm.	108 cm.	107 cm.	99 cm.	112 cm.	101 cm.	119 cm.	116 cm.
			..	..	14·5 kg.	14·5 kg.	13·5 kg.	12 kg.	23 kg.	11 kg.	16·5 kg.	16 kg.
5	2	7	..	..	..	..	97 cm.	72 cm.	103 cm.	91 cm.	..	..
			..	..	..	..	8·5 kg.	3 kg.	10 kg.	7·2 kg.	..	..
5	3	8	..	..	..	..	..	..	109 cm.	94 cm.	..	..
			..	..	..	..	..	..	13 kg.	8·1 kg.	..	..

Die Sammlung abgerissener und bei der Treibnetzfischerei wiedergefundener Angelhaken zum Studium der Wanderung der Lachse wurde fortgesetzt und durch die Mitarbeit schwedischer, dänischer, lettischer und finnischer Forscher unterstützt. Mit besonderer Markierung wurden vor der Verwendung der Angelhaken durch die Fischer im Jahre 1936 7324 Stück Angelhaken versehen und an die Fischer in Neukuhren, Pillau und Kolberg verteilt.

Die hydrographischen Untersuchungen, die im Zusammenhang mit den Lachsforschungen in der mittleren Ostsee vorgenommen worden sind, sind fortgesetzt worden. Abschliessend ist bisher über den Kalk- und Chloridgehalt berichtet worden.

WILLER.

Holland.

The importance of salmon fishing as well as other anadromous fishes, has been greatly declining for a good many years, owing to the regularisation of the rivers, the spoiling of the waters by sewage and oil and by the refuse of factories which caused spawning places within the borders of Holland, if any, to disappear. Before the war about 10 big seine-fishing companies existed in the lower course of the Rhine, but they have now been dissolved.

In 1935 and 1936, seine fishery was carried out during a few summer months in addition to some fishing with drift-nets and set nets in the lower course of the river. Of late the catches of salmon improved somewhat, though not at all to be compared with those of the eighties. Still more insignificant are the catches of sea trout. Allice shad (*Clupea alosa*) has practically disappeared; but the other species (*Clupea finta*) appears every spring in some quantities.

Occasionally salmon is landed by trawlers and coast fishermen.

1. Statistics of Catch.

(a) Quantity of salmon caught (in kg.)

Year	1934	1935	1936
Sea	174	303	269
Coast (brackish water)	185	176	960
River	15,326	16,513	21,450
Total	15,685	16,992	22,679

(b) Number of each kind of salmon taken in river fishing.

Year	1934	1935	1936
Winter and big summer salmon	348	608	1,099
Small summer salmon	1,817	1,578	1,399
Grilse	477	114	370
Total	2,642	2,300	2,868

2. Artificial Propagation.

Number of salmon fry (six weeks old), reared in hatcheries in Holland and put into tributaries of the Meuse in Holland and Belgium: —

Year	1934	1935	1936
	809,000	1,002,000	732,000

In addition, according to an international treaty, many more of this fry (2—5 mill.) are reared every year on Dutch account in German hatcheries and liberated in the river system of the Rhine (in Switzerland and Germany). Indeed, it is the general belief that this supply is the only means of maintaining the salmon stock.

3. No marking experiments in 1936.

4. No new laws of regulations, except minor quota questions.

Irish Free State.

1. Biological Investigations.

In 1936 investigations on the food and growth of the brown trout in two selected localities of the River Liffey, and the age and growth-rate of the salmon from the River Shannon were continued.

2. Artificial Propagation.

During the season 1935/36, 29 hatcheries were operated, 16 being stocked with eyed ova distributed from some other hatchery.

Ova from salmon were collected at 11 hatcheries, of sea trout at 3 hatcheries and of brown trout at 11 hatcheries.

The total number of fry distributed was:

Salmon fry	5,554,650
Sea Trout fry	93,000
Brown Trout fry	1,307,450
Total	6,955,100

This represents an increase in the total of about 3 % when compared with the season 1934/35.

3. Catch of Salmon.

The figures for the complete catch of salmon in 1936 are not available. The weight of salmon exported from the Free State, which usually only differs slightly from the total catch, was 1,149,018 kg., having a value of £ 184,245. This shows a decrease of about 8 % on the catch of the preceding year.

The quantities exported per month, in kilogrammes, were:

January	4,175
February	65,367
March	155,833
April	172,327
May	299,498
June	312,429
July	133,535
August	5,498
September	356

These figures show, as compared with the preceding year, a proportional increase in the catch of spring fish and a falling off in the numbers of grilse.

Latvia.

ıe catch of Salmonidae.

The total catch of Salmonidae (*S. salar* and *S. trutta*) the Gulf of Riga and the Baltic proper along the tvian coasts amounts to 47,720 kg. only for 1936. This means a decrease of about 30 % on the catch 1935 (68,640 kg.) and a decrease with regard to the erage of the 12-year period: 1924—1935 (90,925 kg.) about 48 %. The decrease is mainly due to the wer fisheries results in the Gulf of Riga.

Also the run, and accordingly the catch, of salmon d sea trout in the rivers of Latvia during the year 36 was considerably inferior to that of the previous ar.

tatistics of Salmonidae fisheries.

	1936 kg.	1935 kg.
egion I: Gulf of Riga:		
a. Coast of Vidzeme	5,150	5,870
b. Riga sea shore	34,960	52,965
c. Coast of Kurzeme	1,660	980
Total in the Gulf of Riga	41,770	59,815
egion II: Kolkasrags	1,670	1,965
egion III: Ventspils	1,995	4,960
egion IV: Liepāja	2,285	1,900
otal catch of Salmonidae on the Latvian coast	47,720	68,640

Artificial Propagation.

In the spring of 1936, the following quantities of almonid and Coregonid young fish hatched in the overnment's Hatcheries at Tome and Karli were istributed in Latvian waters:

almon:	
Daugava	3,000,000
ea Trout:	
Daugava	120,000
Gauja	100,000
Salace	80,000
Total	300,000
Brook Trout:	
in various rivers	110,000
Lavaret (*C. lavaretus*)	
Salace	2,000,000
Gauja	200,000
Lakes	100,000
Total	2,300,000
Whitefish (*C. generosus*):	
in various lakes	13,000,000

During the hatching season 1936/37, the following quantities of fish eggs were collected for cultivation at the Government's hatcheries:

Salmon	1,290,000
Sea Trout	3,355,000
Brook Trout	65,000
Lavaret	2,475,000
Whitefish	6,650,000

Biological Investigations.

The Fishery Laboratory of the Ministry of Agriculture continued the collection and the study of materials collected relating to the age distribution and growth-rate of salmon and sea trout from the Gulf of Riga.

La pêche des saumons et truites de mer en 1936, répartie par régions et mois (quantité en kilogr.).

Numéro d'ordre	Régions de la pêche	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Septembre	Octobre	Novembre	Décembre	Total
1a.	Sur le littoral de Vidzeme	18	142	42	347	310	95	112	643	1,064	2,125	250	—	5,148
1b.	Sur le littoral de Riga	62	—	117	684	1,153	3,796	5,182	8,681	7,766	7,508	—	12	34,961
1c.	Sur le littoral de Kurzeme	—	—	—	654	52	150	135	98	37	64	—	—	1,659
1.	Total sur les côtes du Golf de Riga	80	142	159	1,685	1,984	4,041	5,429	9,422	8,867	9,697	250	12	41,768
2.	Sur le littoral de Kolkas	150	—	—	207	122	20	—	55	586	227	35	270	1,672
3.	Sur les côtes de Ventspils	26	5	139	591	232	85	44	199	405	250	—	20	1,996
4.	Sur les côtes de Liepāja	536	46	99	241	513	—	—	—	60	31	14	745	2,285
	Total	792	193	397	2,724	2,851	4,146	5,473	9,676	9,918	10,205	299	1,047	47,721

Poland.

1. Biological Investigations.

Studies on the composition of the stock of salmon appearing near the Polish coast, especially as regards the age-groups, were continued. Scales and particulars concerning the dimensions of fishes were collected.

2. Statistics of Catches in the Sea.

Name of fish	kg.	Specimens	Value in zlotys
Large salmon	57,990	6,478	245,625
Small salmon (mielnica)	5,760	12,234	11,204
Sea trout	3,980	1,549	17,450

The run of salmon and sea trout to the spawning grounds was good.

3. Marking Experiments.

Owing to the fact that the fishery for small salmon (mielnica) is always decreasing on the Polish shore, it was possible to mark a few individuals only. No recaptures were reported.

The following quantities of parrs and smolts of salmon and young sea trout from cultures in ponds were marked and liberated in the lower part of the Vistula:

(a) Salmon:	
1-year parrs from the river Wilija	149 ind.
1- — — — — Dalälven (Sw.)	423 —
2- — smolts from the river Wilija	747 —
1- — — — — —	481 —
Total	1800 ind.
(b) Sea trout:	
2-year from Latvijan rivers.....	1242 ind.
1- — — — —	387 —
Total...	1629 ind.

From the above-named fishes and from those liberated in previous years 52 returns were reported, from the sea as well as the Vistula. Some young sea trout seem to remain a long time in the river. Individuals of sea trout twice recaptured in the river show no increase in length or weight; on the other hand those recaptured in the sea grow very rapidly. Two sea trouts were recaptured during their second migration to the spawning grounds. These fish had been reared in ponds, originating from eggs of sea trout from the river Dunajec but liberated in the river Brda a by-river to the Vistula, near the estuary of that river. They returned to the Vistula, crossed the mouth of the river Brda and migrated farther in the direction of the mother river.

Studies on the migration of young sea trout from the spawning places to the sea were published by Mr. Żarnecki in the Bull. Intern. de l'Acad. Polon. des Sciences 1936. The main results of this study are as follows:

The 1798 two-year sea trout from the river Dunajec, reared in ponds, were liberated in 1933 and 1934 in the river Wisłoka (a by-river to the Vistula) in a place about 900 km. from the Baltic. About 2·66 % were recaptured in river and sea. Some of the fish remained more than one year in the river and migrated a short distance only. The shortest period of migration from the upper part of the river to the sea was 114 days; the longest period was 205 days. The average velocity of migration was 5·08 km. per day. The speed of migration is much less than the average velocity of the current; in the upper part of the river the young fish migrate quicker than in the lower part. — The growth in the sea was very quick. The majority of individuals recaptured in the sea was taken near the estuary of the Vistula; other specimens wandered in a north-eastern direction, one was taken in the Gulf of Riga near the mouth of the river Duna. They were all recaptured at depths from 3 to 8 m. only.

4. Artificial Propagation.

In consequence of very high water in the rivers during the autumn, 1936, it was very difficult to obtain a sufficient number of spawners for the hatcheries. Therefore, the quantity of eggs placed in hatcheries was less than in previous years; but the natural spawning was exceptionally good. Spawners and spawning of salmon and sea trout were observed, not only on the ordinary spawning grounds, but also in higher parts of the rivers and even in rivulets, where they have not been noticed for many years.

The activity of hatcheries was as follows:

Salmon — 30,000 eggs placed in hatcheries.
Sea trout — 120,000 eggs placed in hatcheries,
— 140,000 tiny fry liberated into river Dunajec in spring 1936.

5. New Laws and Regulations.[1])

The fishery for sturgeon was prohibited for three years.

The following close-time for salmon and sea trout were introduced for three years, beginning October 1st 1936.

(a) in the lower part of the Vistula and its adjacent by-waters from December 10th to January 10th, and from April 15th to May 15th;
(b) in the middle part of the Vistula and adjacent by-waters from April 15th to May 31st;
(c) in the upper part of the Vistula and adjacent by-waters from April 15th to May 31st and from October 1st to December 31st.

These regulations do not apply to the rod and line fishery.

Free Port of Danzig.

1. Statistics of Catches.

The catches were made in the territorial waters, in the estuary of the Vistula and in the Baltic. (See table next page).

2. Laws and Regulations.

(a) An order prohibiting the fishery for and the landing of sturgeon for three years, beginning from October 1st, 1936, was issued by the authorities of the Free Port of Danzig[1]).

(b) Close-time for the salmon and sea trout fisheries were introduced by the authorities[1]) as follows:

A. from December 10th to January 10th and
B. from April 15th to May 15th.

During the close-time the capture and the landing of salmon and sea trout are equally prohibited.

[1]) See this vol., part III, App. 14.

Months	Salmon		Sea Trout		Speitzgen (Young Salmon and Sea Trout	
	Number of individuals	Weight in kg.	Number of individuals	Weight in kg.	Number of individuals	Weight in kg.
anuary 1936.....	2	28·—	412	1,943·5	48	43·5
ebruary —	—	—	98	470·—	15	12·—
arch —	—	—	319	1,460·—	53	38·—
pril —	2	9·—	312	1,469·—	137	98·—
ay —	1	7·—	116	623·—	148	105·—
une —	5	56·—	22	130·—	—	—
uly —	29	366·—	28	221·—	—	—
ugust —	27	341·—	41	286·—	—	—
eptember —	5	69·—	475	1,945·—	817	785·—
ctober —	—	—	1,004	5,212·—	414	393·—
ovember —	—	—	6,131	30,014·—	912	763·—
ecember —	—	—	1,430	6,578·—	489	417·—
Total...	71	876·—	10,388	50,351·5	3,033	2,654·5

Portugal.

Owing to the fact that the salmon fishery in Portual is not important enough to permit an organisation f investigations on a large scale, no report can be resented for this year.

Scotland.

. Report on work on Salmon and Sea Trout.

During the year investigations in the life history nd growth of salmon and sea trout by scale reading ave been continued. One paper has been published n salmon and three on sea trout.

2. Scales and measurements of 800 salmon from he river Nith, which flows into the Solway Firth in he south west of Scotland, were examined and neasured. It was found that the most important age roup in the district was that of small spring fish 2·2 years) and that the younger group of grilse 2·1+) were almost as numerous. A feature was the ery small proportion (less than 2 %) of fish in the hole catch which had spawned in a previous year. n keeping with its southerly position the smolts of he Nith are predominantly two-years-old — only % were three years of age. In the course of the ear work has been continued on another, and larger, ollection of scales (1800 fish) taken in the Solway ets, but this investigation has not yet been com-leted.

3. For sea trout the largest collection dealt with 3,374 sets of scales) came from fish caught in the ets at the mouth of the Dee at Aberdeen. One of he chief items of interest found was that a large roportion of these fish did not belong to the Dee ut had merely come into the tidal waters in the ourse of their migrations and if they had not been aptured would no doubt have continued their ourney to other rivers. A few trout were taken in ebruary and March and April, but none of these ere found to be true spring sea trout and all would ave returned to the sea for further feeding before they finally reached fresh water for spawning purposes. None of them had spawned in the previous winter. The collection consisted predominantly of young trout belonging to the ·1+ group and the only other group of any importance was the ·1+ G+ group. 16 % had spawned on a previous occasion and as is usually the case smolt ages were higher than the ages of the salmon in the same area, only 30 % were two-years-old at the time of migration, 60 % three-years-old and the balance four-years-old. The length of the fish corresponded with the length of the trout in the area between Peterhead and the Firth of Tay, from which the majority undoubtedly originated.

4. A smaller collection (under 800 fish) was also examined from the Kyle of Sutherland district, which is situated on the North side of the Moray Firth. Here the smolt ages were very similar to those found in the trout caught in the Dee and the smolt average lengths were also about the same. The number of previously spawned fish, 41 % of the total, was very much higher than in the Dee sample and almost all the rest consisted of the ·1+ group.

5. The Laxford district on the west coast of Scotland a short distance south of Cape Wrath is devoted to angling and not to net fishing. It is famous for its large sea trout, but an investigation of a sample of 745 trout taken there shows that the high average weight is due not to rapid growth in the sea but to an exceptionally high average age. This high age is correlated with a comparatively slow growth in the sea and, owing to the absence of commercial engines, to a very light tax on the stock. The average smolt age is rather high, 70 % three-years-of-age, but the growth made in fresh water is good. Less than 25 % of the total sample were in the ·1+ group and over 60 % consisted of fish which had spawned on a previous occasion.

6. Work is now progressing on collections of sea trout material taken in the Conon (Moray Firth district), the Echaig (Firth of Clyde district) and the Carron (West Ross).

2. Statistics of Catch.

The total weight of salmon, grilse and sea trout boxed for market and sent by rail and steamer in Scotland in 1936 was about 3,700,000 kilos. The nett weight of fish was about 2,470,000 kilos, of a total value of about £ 450,000.

3. Report on Artificial Propagation.

Artificial propagation has continued on a small scale in various districts, the total salmon eggs handled amounting to not more than five million at the most.

2. Commercial trout hatcheries handling eggs and young fish up to two years old have also continued in operation. Definite proposals have been made for a large scale experiment handling ten million ova in one river to test adequately and under proper control the effect of the operation of hatcheries in a salmon river, but so far no decision regarding the finance of the experiment has been reached.

4. Report on Marking Experiments.

The main marking experiment on salmon in 1936 dealt with fish caught in the sea at Loch Inchard, a short distance to the south of Cape Wrath on the west coast. Of the 1300 fish marked during the spring and summer, 150 were recaptured. The majority (two-thirds) of the recaptures were on the north and east coasts, one as far south as Whitby on the Yorkshire coast (410 miles from Loch Inchard) and another at Sognefjord in Norway (400 miles from Loch Inchard). A smaller proportion of recaptures were made south of the place of marking on the west coast, up to a distance of approximately 150 miles. It is hoped to show a map illustrating these recaptures at the Meeting.

2. The marking of salmon kelts in rivers has also yielded a few interesting results, fish being found up to 120 miles away from the place of marking and providing useful material for comparison with the sea marking results.

3. Sea trout were marked in four districts, up to the date of writing some 2500 fish being handled and released. Not a large number of recaptures of these have yet been made but it is anticipated that more will return in 1938.

4. Both salmon and sea trout were marked in the Tweed and from the information provided by previous work here it is possible that some of these fish may be recaptured on the coasts of at least Denmark and Holland. The marks used were mostly of the two-pronged type profixed with the letters "d" "X" or "K", and some marks were also of Professor DAHL's type bearing the lettering "Fishery Board, Edinburgh".

5. Changes in Laws and Regulations.

Nothing to report.

Sweden.

Salmon.

Samples of salmon scales from the West coast of Sweden (Skagerak and Kattegat), Scania and the northern part of Norrland have been collected and are under examination. — Ripe salmon caught in the rivers Ume and Indal for hatching stations, and smolts caught in the river Faxe, have been marked. Experiments with feeding young fish under different conditions have been carried out at the fishculture-stations Kvarnbäcken and Kälarna.

Sea Trout.

Samples of Sea trout scales from the West coast of Sweden and Scania have been collected.